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STONE & WEBSTER PUBLIC SERVICE JOURNAL

JULY, 1907

EDITORIAL COMMENT

Salutatory

All the world's a stage, and the Stone & Webster Journal now makes its appearance. It hopes to play a useful part and to play it creditably. And it will not be amiss briefly to outline, at the outset, the nature of that part.

The Stone & Webster Public Service Journal has certain very definite aims. The first is the creation of a closer and more effective esprit de corps among the Stone & Webster organization. The organization has grown to such numbers, and its parts are so widely scattered over the whole United States, that some means are demanded for keeping the members in proper touch with each other. The Stone & Webster Public Service Journal will strive to make every man in the outlying field know all about what is going on in the home office, and every man in the home office to know what is going on in each of the outlying fields. The purpose of the Journal is to make a homogeneous whole of the widely scattered units of the organization. It is desired that the men doing the pioneer work, no matter how remote their field of operation, shall feel themselves as much an integral part of the organization as those engaged at the headquarters in Boston. Briefly to create a "home feeling" on the Pacific coast as well as on the Atlantic, on the Gulf as well as in the Northwest, in Porto Rico as well as in Indiana and Kentucky, is the aim of the Journal.

A splendid esprit de corps should result. If this end is attained, that high ideal of Bacon will be realized: "I hold every man a debtor to his profession; from the which as men of course do seek to receive countenance and profit, so ought they of duty to endeavor themselves by way of amends to be a help and ornament thereto."

The Stone & Webster Journal hopes to be an aid to every member of the Stone & Webster organization who desires to be "a help and ornament" to his profession. It will strive to realize this hope by stimulating an exchange of ideas among the members of the organization. The methods employed in solving the problems in one field of operations must necessarily be an interesting study to the men in every other field. These methods will be described in the Journal and their results clearly outlined. But this will by no means exhaust the scope of the Journal; for one of its chief purposes is to constitute itself a forum for the discussion of matured ideas which have not yet reached the stage of generally applied methods. The multifarious activities of the organization and the multifarious character of the minds of its members should, of necessity, provide the incentive and the means for a great amount of original thought.

In this way the Stone & Webster organization hopes to keep ever before the minds of its members that each of them is "a debtor to his profession"; and in this way it hopes to furnish them a means to pay that debt.

As the organization and its members expect "to receive countenance and profit" from their profession, so must they endeavor "to be a help and ornament thereto." And this endeavor they can best realize by employing the special knowledge bred of their daily observation and reflection to the creation of a sound and honorable public opinion. The nation is today confronted with a multitude of economic problems of the highest importance. They are problems which cannot be settled wrongly without lasting injury to every man, woman and child in the United States. And yet they are problems whose treatment calls for a high degree of special knowledge. The people, in their collective capacity, will settle these problems; but they will be glad of all the special knowledge which they can obtain from those special students in whose motives they have confidence. The Stone & Webster Public Service Jour-

nal will, we confidently expect, effect a crystalization of thought on the part of the members of the Stone & Webster organization with reference to the great economic questions alluded to above.

Such a crystalization of thought will inevitably have two results. It will better capacitate each member of the Stone & Webster organization to inculcate sound views on these intricate problems. And it will also tend to create a more tolerant spirit among persons of widely different opinions; for where there is the clearest knowledge, there is apt to be the broadest charity. The Stone & Webster Journal is designed primarily for the benefit of the members of the Stone & Webster organization; but if the event shows that the public good has not been promoted, in some measure at least, by the larger knowledge and keener zest which the organization has acquired in this way, the publication will have failed of its purpose.

Stone & Webster Organization

EARLY HISTORY OF THE FIRM*

BY RUSSELL ROBB

Twenty years ago there were practically no electrical engineers who were not connected either with manufacturing companies, electric wiring concerns, or educational institutions, nor was there any place, unless at some educational institution, where one could have an electrical instrument calibrated, or have simple tests and experiments made on new devices.

C. A. Stone and E. S. Webster were graduated from the Institute of Technology in 1888, and they soon realized that there was a small assured field for a consulting electrical engineer, and that there were great possibilities for a technically trained man who was not too technical to appreciate business features, and not too much of a business man to fail to judge properly the technical Stone & Webster consequently started in 1889 in a very small way at 4 Post Office Square, prepared to lay out wiring, to design small plants, to calibrate instruments, and to do such other electrical testing as might offer. On Fort Hill Square they started a small laboratory with the usual galvanometers and photometer room and other simple instruments and prepared to build up business. One of the first discoveries they made was that the safety devices in electrical circuits were most untrustworthy, and they immediately began testing fuse wires and giving with this wire a certificate of test from their laboratory, showing what its action would be under different conditions. They experimented a long time on different alloys and finally put out what is now known as the "Shawmut Fuse Wire," which their laboratory tested for



^{*}This article is the first of a series descriptive of the Stone & Webster organisation. These articles will be presented with some attempt at logical sequence, the aim being to trace the development of the organisation and to show, not only the function of each department, but also the manner in which the various departments are related to one another.

many years. They also tested the insulation of lead cables for several manufacturers, tested batteries, made experiments on many devices for inventors, tested insulating material for appliance manufacturers, calibrated instruments, tested the candle power of lamps, and did all sorts of miscellaneous experimental work and testing. The firm at this time occupied two small offices on the top floor of 4 Post Office Square. One of these offices was later divided up by a partition, the firm occupying the inside room, the stenographer the outside room, and the one or two draftsmen and other men who were employed filling a small office across the hall. The laboratory was a floor in a building on Fort Hill Square. As the business gradually got under way, more important engineering work was undertaken—small isolated plants were engineered, large wiring layout undertaken, and the testing carried on in a more comprehensive manner.

In 1891, the firm was employed by S. D. Warren & Co. to lay out a power transmission plant at Cumberland Mills. At this time there were practically no power transmission plants in the country, alternating motors had not been developed, and it was necessary to use the direct current motors and 500 volt circuits. A plant of 200 or 300 H. P. was installed between the mills of S. D. Warren & Co., and the success of the trial installation led to a very considerable development later with alternating motors. In the early 90's the firm engineered nad supervised the construction of several power houses of considerable size, including two for the Lowell, Lawrence and Haverhill Street Railway, one for the Brockton Street Railway, stations at Allentown, Pa., Nashville, Tennessee, and others. The power plant for the new State House was undertaken also about this time, and a large amount of work was done for the various city departments of Boston.

With the unsettled financial conditions of the early 90's, electrical enterprises which were new and not thoroughly stable were in an uncomfortable position; many of the plants had been very poorly engineered, and in many cases were having a difficult time to make ends meet. Security holders in these companies had very little knowledge of the requirements of the properties on which to base their judgment as to future financial and operating plans. In many cases, accordingly, Stone & Webster were employed to examine the properties, advise as to new expenditures, and often to suggest reorganization plans. The depressed business conditions developed very rapidly the weaknesses in engi-

neering, the mistakes in the conception of enterprises and the faults in plans. Hundreds of examinations were made in these years by Stone & Webster and invaluable experience was accumulated. In no other way could so good a foundation be made for accurate judgment of what a property could do and what constituted a safe financial plan. All of this work led, naturally, to the business side of the operation of properties, the preparing of plans for reorganization of the companies, the organization of companies, the building of properties, and to the employment of Stone & Webster as managers.

A comprehensive business organization was gradually built up, and with the growth in prestige the firm were soon the principals in reorganizations and were the prominent owners in many electrical enterprises. The business soon required an extension of the offices in Post Office Square, and after spreading to other offices on the top floor, the floor next lower down was occupied.

By the year 1900, the firm were managaing seven or eight different public service corporations, and the organization was rapidly being systematized to handle properly this growing phase of the business. The offices at 4 Post Office Square were rapidly becoming crowded, and in the midst of an exceedingly busy time in August, 1900, a serious fire forced the firm's removal at once. Two floors were taken in the building 93 Federal Street, and with the added room the organization rapidly assumed more systematic form and the management of new companies was taken on rapidly. In September, 1903, the firm moved to the present offices at 84 State Street.

"THE RETIRED MANAGER" TALKS—MANY CHANGES SINCE HE WAS IN THE BUSINESS

"Jim, you would do me a favor by touching that bell. Thanks—seems as though I can move less and be more satisfied doing it every day I live. You know what Dr. Osler says—well, I thought at first he was a spectacular chump, but I am beginning to get a different view point."

The Retired Manager looked contentedly out through the Club window at the rain sparkling by the electric lights, and puffed thoughtfully at his cigar.

"I met Alderman Peterson this afternoon; he says he introduced a resolution at last evening's meeting asking for a municipal inspector of meters. The Billville Electric Company don't seem buried under popularity of late, Jim. You don't know what ails Peterson? And you think the Company is giving better service than ever?—Well, as to the latter, I agree with you. Yes, sir; I agree with you. Why, in my day it was an even bet that the lights went out three times between soup and nuts. In those days we ran the Opera House lights off the railway circuit, and every car that came up Sixth Street grade produced Stygian blackness in the Opera House. We had a flagman to hold the cars at critical points in the play, but even at that, Eliza often crossed the Ohio without a glimpse of the ice. Well, I suppose I can't better describe the kind of lighting service we used to furnish than by saying that the Gas people actually pitied us. While our lights were some bad, our railway work was certainly the limit. The principal duty of the superintendent was to see that every man returned his car before he went home, and to take care of the money that was crowded on him. Nobody rode in the cars except careless people who set no value on their time. I remember that we once tried an innovation and washed the windows of a car. Old Dr. Griswold was misled by the result and ruined his new silk hat by forcing it through the window under the impression that it was

open. We had to buy him a new hat, and that stopped any further improvements.

"Yes, Jim; you do give better service; in fact, you are doing an entirely different business. Your business has now developed until it is a science, that is, the administrative department has, but I can't see that there has been much of a change in the 'diplomatic' department so to speak.

"Right here is where I am getting a different view point on Dr. Osler's theory, for my ideas on the lack of evolution in the diplomatic department of public service companies may be doddering senility. This end of the business has stopped right where it was years ago in your case, and you have got more company than a flea on a dog. Did you ever think of the natural advantages we had in those days when we desired to swat a patron who thought he knew how to run our business? To begin, John Swazy and I owned most of the stock; I was President and Manager and John was Treasurer. John knew more folks in this country than any other living man, excepting, possibly, myself, and he knew 'em well enough to eat in the kitchen with the family, and have everybody call him by his Christian name. As to our men, 'employees' you call them, why they were our neighbors. That's the kind of a line-up we had in those days. There were no rules, and they wouldn't have been obeyed had there been any, -and a passenger who got 'flossy' with a conductor settled it with the conductor. A man who complained about his lights was told that he knew what he could do about it by a man who rented him his house, or to whom he owed poker money. As to the city officials, they most all owed John money, and those who didn't thought an electric franchise was a joke on the fellow that got it. Then again, society in this town had not reached that stage where it began to think in large chunks. So far as its relations with our Company were concerned, its reflections were individual or personal. If one of our men 'sassed' anybody the franchise of the Company was not hit in the solar plexus; simply the schedule was interfered with during the adjournment behind some neighboring barn to arbitrate the matter. Now, as I view it, a conductor while on duty is no longer a citizen; he is clothed with a uniform, given a book containing more rules than I should care to count on a hot day, and turned loose on the public, an integral part of a corporation that knows nobody nor frequents the kitchens of the lowly. When this individual tells a person to 'step lively' or directs him to the 'next car' with his eyes fixed as though he saw two dollars in the distance, that person takes a dislike to the terms of the franchise. These haughty ways, and the habit of calmly ignoring a patron's existence are sure to culminate some day. Perhaps the motorman is so busy with another corporation atom that the citizen is left standing on the corner, with another car due in thirty-seven minutes, if it is on time. He is now due to drop in on you, in order to express to you how pleased he feels over the incident. Do you tell him to come right in, shake him by the hand, and listen as though you are interested? your life, you don't, my boy. You keep him cooling his heels, and heating his insides, while you figure out how many ohms resistance there are in 396 feet of trolley wire, and when he does get in you assume a judicial air that would leave a Chief Justice of the United States Supreme Court in the back stretch. You are going to decide which is right, the employee or the patron, it stands out all over your visage like the horn on a rhinoceros. When this man leaves your managerial presence, he has taken his first degree in political economy, and has more ideas on the subject of municipal ownership than William J. Bryan. I saw the other day that Marshall Field said his success was due to one rule,—'Always start with the premise that a complaining customer is right.' You see, he had been watching his diplomatic department.

"You say that you don't know what ails Alderman Peterson; well, I do. Peterson came from down in Acton County; started here as a carpenter, working at his trade. He got a little money together, and borrowed more from Samuel Fuller to start in for himself. Naturally, Peterson was more or less friendly with the Fuller family. Old Samuel Fuller died leaving nothing, on account of bad investments. His son George went to work as a clerk, and is living in a rented house over in the Third Ward. here is where your municipal meter inspector comes in. has to be somewhat economical and somewhat minute in his financial estimates, and it is probably this that led him to the conclusion that his meter was a trifle nimble as it were. He brought this to the attention of your minions down stairs, and after listening to a series of conversations that resembled that machine that was used by the telephone company awhile, and which told you in perfectly respectable, but exasperating language, 'The line is busy, please ring off,' he got peevish and refused to pay his bill, his lights were then cut out and he has now enlisted Peterson on his side.

"Now if your diplomatic department had been as well developed as your administrative department, George would have been advertising your Company at no salary.

"I tell you, Jim, you can't operate a company as we old fellows used to, you would be ashamed to; nor can you deal with the public with the nonchalance of twenty years ago. You have solved the operating problem to the queen's taste, and the diplomatic department is now up to you good and hard, and the beginning is to surround yourself with the right men. There are some drawbacks to this plan, in that a manager has to scratch gravel to hold his job. These capable subordinates crowd toward the front office pretty hard."

GENERAL ELECTRIC COMMUTATING POLE RAILWAY MOTORS

BY H. L. PARKER

A representative of the Engineering Corporation reports as follows in regard to his recent visit to the General Electric Company's works at Schenectady, N. Y., where he witnessed some tests on their new commutating pole railway motors.

The General Electric Company are now building the following standard types of commutating pole railway motors:

GE-202.	 	 	 		 	 	 		50	h.	p.
GE-204.	 	 	 		 	 			75	h.	p.
GE-205.	 	 	 		 	 	 	. :	100	h.	p.
GE-206.	 	 	 		 	 	 	.:	125	h.	p.
GE-207.	 	 	 		 		 	.:	150	h.	p.
GE-208.	 	 	 		 		 	. 5	009	h.	ъ.

These motors are wound for 600 volts as standard, and have a liberal margin at this voltage, a good commutation is a special characteristic of this type of motor.

On account of the remarkably good commutating characteristics of these motors their over-load capacities are considerably increased, and a more rugged form of motor is furnished, which is less subject to injury by careless handling of motorman than the present standard railway motors. This fact is of importance on heavy grades, or where cars are equipped for high speed work, and also where they start and stop frequently in cities.

The motors which we saw running were the GE-202, GE-204, and GE-208. On the GE-202 and GE-208 we saw them put five hundred, six hundred, seven hundred and eight hundred volts, and with normal current, double normal current, and finally (with 600 and 700 volts) three times the normal current. We could not see any sparking whatever at any time. This was true also when the motors were run in the opposite direction with these loads. On the GE-208 they put 225 amperes at 700 volts and threw the load off and on without having any intermediate resistance. The spark-

ing was hardly noticeable when the switch was thrown in or out. Then they put on 230 amperes at 800 volts and again threw the load off and on repeatedly. There was a slight flash when the switch was thrown in, which the General Electric engineers called a contact flash, the same as would be obtained by the making and breaking of this load between a carbon brush and a metalring the size of the commutator. There was no vicious flashing or "squealing" of the commutator, such as would be obtained on the regular four-pole motor under a test of this kind. There is no question but that a regular four-pole, 500 volt motor would flash over under this test.

The fundamental advantages of the commutating pole motor lies in its good commutation properties, and its use will permit of operation at full 600 or 625 volts, and of high speeds without danger of flashing over. This is of particular importance in subway, elevated and interurban work.

Even in regular 500 volt city work, the commutating pole motor possesses the considerable advantages of reduced maintenance on account of the much smaller wear of commutator and brushes,—greater reliability of service due to the absence of flash overs, and to decreased wear and tear on the controllers and other parts of the car equipment, due to absence of flashing.

The General Electric Company make the following claims for their commutating pole railway motors:

- 1.—Very substantial mechanical construction.
- Practically sparkless commutation even on heavy overloads.
- 3.—Flashing at commutator largely reduced, if not entirely eliminated.
 - 4.—Less wear on commutator.
- 5.—Cleaner and more reliable motor because of the reduced carbon and copper dust from brushes and commutator.
 - 6.-Marked reduction in heating of commutator.
 - 7.—Increased life of brushes.
 - 8.—Lower magnetic densities and smaller core loss.
- 9.—Increased efficiency and free running capacity because of lower core and commutator losses.
- 10.—Improved shape of speed curve giving greater economy during acceleration.
 - 11.-Lighter field coils to handle

VALUE OF PUBLIC CONFIDENCE

BY L. R. NASH

The recent statement of Gen. Wm. A. Bancroft, president of the Boston Elevated Railway Company, to the effect that the most valuable asset of a public service company is the friendship of the public, will be readily accepted by managers of such companies as a very important and timely one. Few men even outside the operating organization of public service companies would seriously question this statement, but tangible proof of its correctness is not always at the hand of either the public servant or the public whom he serves. Such proof has, however, recently appeared in definite and convincing form in Savannah, and may be of interest to public service companies in other places.

The situation in Savannah a year or so ago was as follows: The Savannah Electric Company was looked upon by the community generally as a foreign corporation, owned and operated in the interests of northern capitalists. It was understood that a heavy capitalization existed, including a large common stock issued without original value, on which interest and dividends were paid and sent out of town in large amounts. The community as a whole was ignorant of the company's financial standing, as no statements of earnings, expenses, fixed charges, etc., were published in the local papers, or at any other generally accessible point. All the steam roads entering the city, on the other hand, published weekly or monthly statements of earnings, expenses and fixed charges, comparing them with the previous year's figures. ural inference from the absence of such figures from the Savannah Electric Company was that the Company was earning such large profits that it was thought unwise by the owners to enlighten the public regarding them, lest an agitation for lower rates be started.

As far as rates were concerned, the company's standard schedules did not fairly represent the average or normal cost of service, and it was the general impression of customers that the company's rates were exorbitant, this impression coming from the high rate in the maximum demand form of contract that was standard. The company's transportation department was also charged, to a less extent, with unfairness in exacting two fares on certain suburban lines, and in continuing to use from year to year small cars frequently considered by the public as relics of the old horse car days. Prejudice caused the company loss from time to time in unfavorable decisions of juries in damage cases, and resulted finally in the starting last year of an opposition lighting company, which received a fair share of patronage.

Recent careful consideration indicated that the future success of the company demanded the securing of the confidence and co-operation of the community. The first step taken to secure this was through a newspaper campaign started a few weeks ago, which has so far been conducted in a way to bring out the following points:—

(1) The developed resources of the City. (2) The importance of having these resources and advantages appreciated by outsiders, as well as citizens. (3) The undeveloped resources of the City. (4) Strategic position of Savannah in manufacturing, distributing and transportation matters. (5) The desire of the company to develop the city for its own gain as well as the City's.

The points brought out were a revelation to many even among the progressive business men of the city, who began to realize the great advantage to their own interests of the expansion of the city.

This co-operative advertising matter was followed by an offer on the part of the company to donate a generous sum to exploit the city as a manufacturing and distributing center, providing the Chamber of Commerce, representing the commercial interests of the city, and the city itself, representing all tax payers to whom the development of the city and the improvement of their property should appeal, would each donate an equal sum. It was desired to raise not less than \$7,500. This offer was followed shortly by information regarding the company's business, information that had not been given out locally before. The public was told that in spite of the impression that the company was annually sending very large sums of money out of the city, the Savannah Electric Company had, as a matter of fact, since it started business in Savannah, spent more money in additions and improvements to its property than it had sent out of town in interest and dividends, the net flow of money, therefore, being inward instead of outward. The company also showed what large sums of money were disbursed annually in the city, and it established the fact that home manufacturers and dealers were patronized so far as possible, and that much equipment, including cars, ordinarily purchased elsewhere, was being built in the company's own shops, thus utilizing local raw material and labor. It was likewise shown that instead of maintaining uniformly high prices for its electric light and power, there had been constant gradual reductions, occurring at times when almost all other commodities were materially increasing in price.

What has been the result of this work? Favorable press comments, congratulatory letters, general public approval and a hearty appreciation of the advertising fund offer, and a prompt raising of the necessary amount by the trade bodies, with every expectation that the city will follow with its equal donation. More favorable verdicts in damage cases also seem to indicate a better feeling toward the company on the part of the rank and file of citizens from whom juries are ordinarily selected. The lighting business, instead of falling off in the face of competition, has shown a material increase not only in kilowatt hour production, but even in earnings; and there has also been a greater increase in connected load than during the corresponding months of the preceding year before lighting competition started. The company's connected light and power load is today the largest in its history.

It would appear from the above that theory and practice go hand in hand in Savannah, and the results have been so satisfactory that other companies under similar circumstances should not hesitate to try similar methods.

DEPRECIATION

In the case of large permanent undertakings where the multiplicity of plant units is so great that renewals and replacements approach in time an average that will make the expenditures therefor nearly uniform, the matter of depreciation may be ignored.

Where there is no average to insure a continuous preservation of the properties, there is an absolute necessity of making proper provision for depreciation before figuring net profits, and it is to this class of companies that the following discussion applies. Some of these recognize the principle of depreciation by writing off lump sums occasionally—as their earnings appear to warrant, or because of some legal requirement—usually without any regularity as to time and amounts, and seldom in the spirit of providing an economical safeguard against a shrinkage in capital values. Others ease their consciences, so to speak, by making charges to maintenance of what is properly new construction—the fallacy of such accounting being perfectly apparent, as the veriest subterfuge for depreciation at the sacrifice of showing true cost of plant. other companies evade the question entirely, thereby laying up burdens for the day when extensive rehabilitation is imperative, and when, in many cases, they will find themselves with no other "reserve" than a surplus depleted by the dissipation of fictitious profits as dividends. Until loss by deterioration is accounted for there can be no true net profits,-statements ignoring that element of loss are misleading.

As regards street railway and lighting corporations, it is said that no rule of depreciation can be applied alike to all companies, that a fair rate of depreciation which could be borne by one company would figure into insolvency another laboring under more unfavorable conditions, with earnings barely sufficient to justify its existence. No one has the hardihood to claim a rate applicable alike to all companies. Like methods can be established; but so far as the rate is concerned, varying conditions in different localities may materially affect the measure of actual deterioration, and

each company is entitled to independent consideration; in which case there is small excuse for prolonging the life of a concern with chronic inability to preserve its plant and pay dividends.

There is a diversity of opinion regarding the methods of depreciation, some favoring the use of a fixed percentage of gross earnings, some holding that it be taken upon the cost of plant, while others favor charging a certain sum per car mile, per car hour, or per kilowatt hour. But after all, it is not so much what method is used, as that some logical and unifom method be used. To decide prematurely upon a definite and final plan is unwise. It is better to begin with an arbitrary method and let the final scheme be the outcome of thorough study and analysis.

Much confusion appears to exist in distinguishing depreciation from maintenance. This can be avoided by confining maintenance to expenditures in connection with current repairs and minor renewals, and treating depreciation as deferred maintenance, or as a loss in value of plant structures which become incompetent to perform their functions through a gradual deterioration, or which no longer produce satisfactory results owing to a great growth in business or to changes in the arts.

Maintenance, as above, is properly a part of operating expenses, while depreciation should be treated independently of operating expense and deducted from net earnings by charges to Profit and Loss. Plant accounts should be left to show original costs, and credits for depreciation should go into a Depreciation Reserve account. It need scarcely be said that the cost of replacements should be charged to Depreciation Reserve up to an amount representing the original cost, the excess, if any, to be charged into Plant.

To determine by a more accurate method what amounts or percentages to use in depreciating plant, an analysis is necessary to ascertain the original cost, date of purchase or installation, estimated residual value, the probable life, and the amounts which, put aside without interest, or at compound interest, will, in the determined periods of life, equal the cost of the original plant. Cash equivalent to these amounts should be actually put aside for investment where it can be done to advantage, but many corporations would doubtless find it more advantageous merely to carry credits into the Reserve account and put the money back into the property.

In making an analysis of plant, the chief difficulty lies in

finding the terms of probable life, the accuracy depending, of course, upon the experience and judgment of the persons making such estimates. The claim that a wide variation will be encountered in estimates of life made by different engineers and by managers of different companies is not an insurmountable difficulty, since by comparison it is usually possible to find a common ground of agreement. In the case of a central management of different companies, the estimates should rest finally upon persons authorized to decide for all of the companies, in order that the results may be as uniform as conditions in different localities and companies will allow. In arriving at these estimates, the question of changes in the arts and growth of business should be considered; although, in order to partially eliminate factors so entirely conjectural, it would seem that specific estimates in detail need not be made as in the case of physical fatigue, and this should not materially affect the result, provided the analyses are subjected to periodical examinations and adjustment.

Regarding the methods of depreciation, there are those who favor the use of a fixed percentage of gross earnings, claiming that the gross earnings represent the extent of the use of the property, and that deterioration in different years is more or is less, proportional to the gross earnings being greater or smaller. This is doubtless true in a measure; but deterioration is taking place even on idle property, and there is depreciation due to various causes which the volume of gross earnings will not always indicate. One objection to this method is that an extravagant manager having a Reserve account against which to charge replacements, can abuse the privilege with greater impunity than in a system treating the question of plant values and upkeep with a greater degree of thoroughness.

Such a method is that of taking depreciation upon the cost of plant and requiring a record showing the details of depreciation and replacements. At first glance this may be said to be expensive and impracticable; but it need not be so, because by eliminating certain classes of construction where renewals are necessary, replacements are continuous and therefore a matter of maintenance, and, so far as the items of plant are concerned, limiting depreciation to the more important parts, the replacement of which will be burdensome to any particular month or year, and grouping these parts, this method can be simplified in a manner to be practicable and, of itself, to necessitate no additional clerical help.

On the one hand is a simple method of depreciation by a percentage of gross, but disclosing not the slightest detail or information relative to depreciation on parts or classes of plant, and with a tendency to run along indefinitely without adjustment. On the other is a method treating the subject far more accurately, by taking it, not upon an uncertain whole, but upon the kinds and parts, disclosing to the management at all times the actual stage of depreciation, furnishing a valuable source of information, and inciting to at least annual examinations with a view to adjustments and the betterment of the scheme.

This method is dwelt upon here as a refinement worth striving for, and in the belief that the question of depreciation in a broad sense is second to none in an honest administration of properties. To a corporation it means a policy of self-preservation and foresight, and cannot be dismissed as being merely a matter of ethics. The skill of management is not shown by increased gross earnings nor by decreased operating expenses, unless there is as much care exercised in the treatment of capital values.

In addition to the question of plant depreciation, there is also that of depreciation of franchise charges. Where a public service corporation has capitalized expenditures in connection with the acquirement of a short term franchise, can any legitimate reason be given for not creating a Reserve account to offset the charges by the time the life of the franchise has expired?

Sinking funds for the retirement of bonds, and reserves for depreciation of plant and franchises, are in the same category of obligatory measures for the preservation of capital. To include the element of earning capacity in capitalization is no reflection upon a management; but it carries a responsibility for keeping values intact, and the burden of maintaining plant at a high point of efficiency and of establishing reserves to provide for antiquation and deterioration. It is a short-sighted policy which ignores these obligations, and one that must eventually result in a shrinkage in investment accounts. To work a property to the utmost limit in obtaining and disbursing revenue for the sole benefit of present dividends, is a violation of the right of a shareholder to the protection of his principal.

CHEMICAL FUEL ECONOMIZERS

BY L. B. BUCHANAN

Recently there has been considerable activity in chemical fuel economizers. This has undoubtedly been brought about by newspaper stories of a great discovery made by a shoemaker in Pennsylvania, whereby ashes can be reburned and made to yield heat comparable to that obtained from the original coal.

This particular ash Peruna and revivifier is said to consist of common salt, oxalic acid and water, which are added in comparatively small proportion to a mixture of ashes and coal. There is nothing in the chemical properties of any of these substances which should add any appreciable amount to the heat units derivable from the coal burned. With the exception of the oxalic acid, there is not tendency for any of the ingredients except the coal to undergo exothermic oxidation or reduction, and the acid itself is oxidized to the last stage but one. The only probable result of the use of such a compound is the production of a slow fire and some generation of hydrochloric acid gas from the interaction of the salt and water in the presence of hot carbon, which cannot be beneficial to any iron work exposed to the passage of the hot gases.

Another fuel medicine recently offered for sale to one of our companies was examined by the Chemical Department, and was found to consist principally of sodium nitrate with common salt added—perhaps as a preservative (?), but more probably because it is cheap and will dissolve in water according to the directions. This compound certainly has a more sound chemical reason for existing than the first mentioned; because the nitrate has available oxygen, which would aid combustion of carbon just as it does in gunpowder, of which it is a component. But the directions provided for the use of so small a quantity per unit of coal, that any effect of this kind would be immeasurable. Then again, the possibility of generation of hydrochloric acid should bar its continued.

use in any boiler or where any metal work is exposed to the hot gases.

Other compounds of similar nature have been brought to the writer's attention in the past and have been of almost identical composition, although some contained bichromate of potash instead of salt, which rendered them at least less harmful, even if not more effective.

In short, none of the compounds hitherto examined, used as directed, can be measurably more efficacious than the water they contain. Certainly the wetting of coal has long been practiced with many differences of opinion as to results. In considering this, it should be borne in mind that any water added must be evaporated, and that the heat necessary comes from the coal and is not delivered to the boiler, because the steam escapes with the smoke without condensing; hence the latent heat of vaporization is wasted.

It will therefore be wise to defer trial of any chemical economizers offered, even on free trial, until the same can be examined to determine that they are harmless as well as ineffective.

News From The Companies

HOUGHTON COUNTY, MICHIGAN

Houghton, Hancock and Calumet are the principal towns served by the central station of the Houghton Electric Light Company. Each town is practically of the same size and lay out, and friendly rivalry exists between the merchants of each, not only as to the adoption of the best methods of advertising, but also as to the best and most up-to-date methods of properly illuminating the main thoroughfare of their respective town by night. This rivalry may be the sinew of the success of co-operative lighting of streets by merchants in the county; but be that as it may, we feel perfectly justified in saying we have the most unique and beautiful method of street illumination of any town of equal size in this state, if not in the country.

In 1903 Hancock took upon itself the task of entertaining the firemen of the Upper Peninsula of Michigan, and accordingly different committees were appointed to arrange for their enter-One of these committees, known as the "Decoration Committee," got together for the purpose of properly illuminating their main thoroughfare and city hall, and, with the advice of our company, approved and adopted the following plan: The stringing of two strands of wire one above the other, on each side, from one end of the business section of the main street to the other end. The placing of these strands of wire incandescent lamps of four candle power, four feet apart, having the lamp on the top wire placed directly over the centre of the space between two lamps of the lower strand, so that virtually the street was lighted by electric bulbs placed two feet apart, on each side its The tower and entire front of the city hall was also wired for numerous incandescents. When the work was completed and the current turned on, it presented a novel and pretty sight. Although this arrangement was only intended to be temporary, yet so well did it take with the merchants, that after the fair was over they clubbed together and were successful in getting enough subscriptions to warrant having the lights turned on each Saturday night.

Houghton was not going to be outdone by its neighboring town, and its council began to get busy along similar lines. A committee was appointed by the mayor to take the matter in hand. This committee waited upon the management of our company, who agreed to light two blocks of the main thoroughfare similar to that of Hancock, as a demonstration. This much done the merchants wanted more, and the committee got busy upon their subscription list, and were successful in raising sufficient to light the business section of their main street its entire length on each side with incandescent lamps of four candle power placed four feet apart, not only on Saturday nights, but each night of the week.

Calumet followed in the footsteps of Houghton. Seeing that these two towns were somewhat ahead of them, Hancock took greater courage and brought the matter of having this extra illumination of their main street each night, instead of Saturday night only, before their council, who in turn appointed a committee to take up a new subscription list among their merchants. This committee, with the aid of our company (who, by the way, took kindly interest in it also) were successful in raising all but \$40 per month of the amount required, in order to have our company reconstruct the line placing the lamps four feet apart instead of two as heretofore, and burning each night of the week. The council at its regular meeting appropriated \$40 per month towards this undertaking to meet the deficiency, and now Hancock, Houghton, and Calumet enjoy having their main streets as light as day, each and every night of the year.

The gross income, with the cost of operation reduced to a minimum, is fairly profitable to our company, and although we have only a yearly contract for the lighting of these lamps, yet so well pleased are the merchants that we believe that the contract will be renewed from term to term for a number of years to come. As a reason for this belief, we may say that Houghton at the present time is considering the advisability of extending this form of street lighting to residential streets as well as the business section, and if Houghton should do this, the other towns are sure to follow.

We think that if this method of co-operative street lighting by merchants is tried in other towns, it will be as successful as it has been in this county.

The 250 K. W. Westinghouse Railway generator, which is to be

installed in the Lake Linden power station, has arrived and is being put into place. This will give a greater margin of power for the system, and it is especially required to maintain voltage on Lake Linden division under heavy summer loads.

The new 110 foot iron stack, which is a duplicate of the one in use at present, has arrived at Hancock power station and has been erected. Additional draft will be secured by this means, and repairs will be effected on the old stack.

Spring has at length appeared here, although the weather is still cold and disagreeable. One of the worst blizzards of the winter came on the days April 16-19.

It has been decided to rebuild the large pavilion at Electric Park which was burned down last year. A substantial building with large dance hall, wide verandas and restaurant will be erected, and we expect a continuance of last year's good attendance. The season was just at its height when the main pavilion was destroyed by fire last summer.

The general office in Houghton has been extended to take in several more rooms, which had become necessary on account of over crowding of our old quarters. This office is now headquarters for the manager, assistant treasurer, superintendent of lighting, contract agent, electrical engineer, claim agent, railway and purchasing agent, railway and lighting. The office of superintendent of railway is in Laurium, the assistant superintendent of railway in Hancock, and the assistant superintendent of lighting in Calumet. A private telephone exchange will be installed in the general office.

FORT WORTH, TEX.

By far the most important event in the history of Fort Worth for many years, was the Local Option election held in Tarrant County, of which Fort Worth is the County Seat, on Saturday, April 27, 1907. The County of Tarrant is a prohibition county, with the exception of the cities of Fort Worth and North Fort Worth.

On Friday afternoon, March 22, 1907, during the close of the Cattlemen's Convention, which was being held at Fort Worth, County Attorney Jefferson D. McLean, was assassinated on the main street of the city by a gambler named Thompson. McLean's deputies had, prior to the shooting, raided Thompson's gambling house. McLean was killed instantly, and Thompson, attempting

to escape, was pursued by Hamil Scott, a Deputy, whom Thompson also shot, and who died on May 1, 1907. Thompson escaped to a lumber yard in the center of the city, where he was captured by the officers, after having been shot several times and he died in the county jail two days after the shooting. In his campaign pledges, McLean had stated that if elected he would cut out gambling in Fort Worth, and he had been very aggressive in raiding the gambling houses. The news of his assassination was received with a thrill of horror by the entire community, and in fact by the entire state; and the result was a new law enacted a few days after. by the Legislature of the state, making gambling in the state a penal offence. The prohibitionists in Fort Worth had been patiently waiting for an opportune time to petition the County Commissioners to call an election for the purpose of determining whether or not Fort Worth should have local option, and the killing of McLean gave them this opportunity to present their petition, as they believed that local option would carry with the people in their present frame of mind. This petition was presented shortly after McLean's unfortunate death, and the election was called for April 27. There was considerable excitement during the campaign, which lasted about three weeks, the general supposition being that the result would be extremely close. It was known in advance that the cities of Fort Worth and North Fort Worth were going overwhelmingly against prohibition, and it was assumed that the country would go overwhelmingly for prohibition; so that the result of the election was in doubt up to the counting of the votes. The campaign for prohibition, and the consequent agitation resulting from it, affected the business of the city very seriously. There were practically no real estate transactions during the three weeks, and all building operations were suspended, except those that had been actually contracted for, and all that the people could talk or think about was the coming election. business men of the city felt that prohibition was not the proper method of solving the liquor question, and that if the election resulted in a victory for the prohibitionists, it would very materially retard the growth and prosperity of Fort Worth. A very strong committee of business men was organized for the purpose of fighting the prohibition sentiment. The election resulted in a victory for the Anti-Prohibitionists, the majority against prohibition being about 3,000, out of approximately 9,000 votes cast; so that the question of local option for Fort Worth has probably been definitely settled for some time. The new liquor law passed by the present legislature which has already gone into effect, requiring saloons to close at 12 midnight and open at 5 A. M. and to remain closed on Sunday, will undoubtedly have the effect of regulating the liquor traffic in a very satisfactory manner throughout the state.

EL PASO, TEXAS

The Bitulithic pavement now being installed in the paving district No. 1 of the City of El Paso, is about three-quarters completed. This is the first paving ever installed by the City of El Paso and includes about 200,000 yards of streets in the business district. The pavement is giving universal satisfaction and has greatly improved the appearance of the business district. The new street railway track work in connection with the paving consists of 9-inch 90 pound rail of the Boston elevated section, placed on treated ties embedded in a 12-inch concrete base.

Washington Park will be operated by the El Paso Electric Railway Company this summer. The attractions will include the theatre, base ball grounds and the race track, boating, bowling, pool, billiards, and moving picture machine, together with bar and restaurant. The company has leased the concessions in such a way as almost to pay for the rent of the Park.

The extensions to this company's power station which were commenced last summer, are being completed this week. They include two 500 K. W. turbo alternators, one 300 K. W. motor generator, and about 2,000 H. P. capacity in condensing apparatus, cooling tower, and heaters, as well as 1,000 H. P. rated capacity in Sterling boilers. The company's K. W. H. output has increased 73 per cent. in the last twelve months.

A new amusement enterprise has been started in Juarez, known as Cowboy Park, in which roping contests, bronco busting, etc., take place every two weeks. Roping contests have been prohibited in the state of Texas for the last two years, so that it is necessary to hold such events in Mexico. This helps the earnings of this company, however, as the park is very well patronized by Americans from El Paso.

HOUSTON, TEXAS

Peace and prosperity pervade all Houston despite the cold wet spring and the rumble of legislative thunder from Austin. We are enjoying an unprecedented state of quiet and efficiency in municipal politics. The city has never been so well governed as under the present commission form of government.

After two years of strenuous work on the part of Mr. Rice and his associates, Houston has been relieved of half a million dollars of floating debt, hundreds of thousands of dollars' worth of permanent improvements have been installed from funds obtained in the general revenue, the tax rate has been lowered 10 per cent., the expenses of operating the municipal government reduced materially, the efficiency of the different departments of the Government increased many fold, and a municipal organization operated solely on business principles permanently put into force. Political factions have almost disappeared from municipal affairs, and a state of general quiet and happiness exists, which not even the efforts of some of the State legislators (frightened by an empty treasury), putting into force an untried and discriminating system of gross receipts taxation, have been able to disturb.

Business conditions are excellent. Banks are increasing in number, and their deposits show rapid growths which surprise even their most optimistic officials. Large amounts of construction work are being pushed forward throughout the town. Two large seven-story modern office buildings are in the course of construction in the centre of the business district, while scattered through the retail store district and the residential district large three and four-story brick stores and apartment houses are springing up. One of the local newspapers estimates that \$12,000,000 worth of construction work is under way or about to be started during the next six months in Houston. Discounting the enthusiasm of the newspaper by 50 per cent. leaves the town with \$6,000,000 worth of work on hand during the next year. As the total assessed valuation is but little over \$40,000,000, this is a fair indication of the remarkable state of prosperity which exists.

Since Houston is the centre of a large agricultural district, or more properly the exporting point for this district, the chief factors in the prosperity of the town are the crops. At the present time, the cotton crop is somewhat late, owing to continuous rains and cold weather. The rice crop is in good shape, as is also the corn on which the Central and South Texas cattle are fed during the winter months.

The fuel oil which has been so long a considerable source of wealth in South Texas has advanced to such a high price as to make its use almost prohibitive for fuel purposes. This advance

in price is due to the increase in oil as fuel and to the failure of two or three permanent fields, such as Humble, Beaumont and Jennings, to develop with the demand. It is generally believed throughout the southern part of the State, however, that the deposits of South Texas are not yet exhausted, and that history will repeat itself again in the fuel oil business by the bringing in of a new oil field. It is even claimed that fields have come in from time to time, and have been bought up and closed up by the Oil Trust. These claims, however, are not founded on any facts which would warrant such conclusion. Evidences of oil and the possibility of fields in the immediate neighborhood of Houston have been discovered from time to time, and it is not at all unlikely that a field will be brought in in the neighborhood of Houston during the course of the next couple of years.

Labor conditions at the present time have been as consistently peaceful as the political situation, despite the general agitation for increased wages throughout the country. The locomotive engineers' strike on the large railroads during the early part of January and some sporadic small strikes in the local trades organization have been the only evidences of unrest among the trade unions. There has been a disposition on the part of every prosperous business man in the town to share this prosperity with employees, and advances in wages have been frequent. In fact, the crying need of our town today is efficient skilled labor, and one needs but to talk with any of the employers of large amounts of labor to realize that it is not so much a question of wage as it is of efficiency in the Southwest today. Texas, and particularly South Texas, needs today 500,000 emigrants of the hardy northern European stock.

In our own street railway business, the continuous wet weather and the tremendous advance in the price of fuel have been the only conditions that prevented the company from sharing fully in the general results of prosperity. Oil which averaged between 50c. and 60c. a bbl. during the same period in 1906 has been purchased, for the remainder of the year 1907, for a price varying from \$1.14 to \$1.18 per bbl.

The company has just ordered ten new double truck semiconvertible cars to take care of the increase in the summer and fall traffic. These cars are of the type now being generally adopted by our Texas companies as the standard rolling stock. They are the Brill grooveless post type of car approximately 40 feet overall, with a seating capacity of 40, four four-motor equipments, air brakes, and all other modern form of construction, such as the steel frame bottom, etc.

Of the construction work, we are just completing the installation of a 650 Kw. D. C. unit composed of a Hamilton-Corliss engine direct connected to a Crocker-Wheeler generator. On the track and overhead, enough work has been done to put all of Houston overhead in first-class condition. Nearly two miles of our business district track has been entirely torn up, and for old 45 lb. rail of antiquated construction new 9-in. girder rail of 89 lb. weight on a concrete base has been installed with vitrified brick pavement.

A large portion of the special work in the Main Belt has been renewed, and split switches are becoming such rare events that even the public comment upon it.

There have been of late few changes of interest in the Houston organization. Mr. R. T. Sullivan, Lawrence Scientific School, 1906, has joined the forces of the company as a student, and has been assigned to the transportation department under Wesley Wentworth, general superintendent.

The convention of the Southwestern Electrical & Gas Association, held in San Antonio on May 14, 15 and 16, was attended by M. Miers, master mechanic, A. W. Q. Birtwell, assistant treasurer, Flint McGregor, in charge of the maintenance way and overhead, and Inspectors Curley and Weber.

GALVESTON

Sunday, May 19, 1907, was the record day for station out-put of this station since its erection. The maximum hourly D. C. wattmeter readings were 472 K. W. at 8.00 P. M., with an observed peak of from three to five minutes before and afterwards, of 700 K. W.

On the A. C. the maximum hourly wattmeter reading was, at 9.00 P. M., 409 K. W., with an observed peak of about fifteen minutes between 9.00 and 10.00 P. M., of 420 K. W.'s. The above loads were carried on two 325 K. W. D. C. units and on one 200 K. W. and one 125 K. W. A. C. unit and with three nominal 250 H. P. Babcock & Wilcox Boilers.

The Galveston Electric Social Club held its Annual Invitation Hop at Woollam's Lake on the evening of May 7th, there being in attendance over 150 of the employees, including the manager and officials, and these, with their families and invited guests, made a full attendance of nearly five hundred people. The evening was perfect and everything passed off delightfully. The company furnished free special cars, as a courtesy to the returning guests.

The new 300 K. W. A. C. generator is now being installed on the lot next the power station and bids fair to be ready for use within about two weeks. The station loads above noted show the necessity of this.

Also No. 1 Babcock & Wilcox 250 h. p. boiler, which is being entirely rebuilt, will be again placed in commission within a week. The foundations for the new 500 h. p. Babcock & Wilcox boiler are completed and erection is about commencing, and it is hoped that within a month this boiler will also be in commission.

The municipal election occurred on Tuesday, May 14, 1907, and, notwithstanding considerable opposition on the part of the worst element in town, such as the gamblers, policy dealers, municipal ownership promoters, ambulance-chasing lawyers, and others of that class, the entire Board of Commissioners were re-elected for the fourth time. This is quite a victory for the present Commission, as the opposition was, at this time, better organized and stronger than ever before.

The Annual Convention of the Texas Press Association was held in Galveston, May 16, 17, 18, over two hundred editors, etc., of the Texas press being in attendance. As a courtesy to the press, this company relaxed its rules and gave the attending members the privilege of riding free on their badges, and the example of the Electric Company was followed by the bath-houses and pleasure resorts on the beach. This action was much appreciated by the visitors, who framed a special resolution thanking the company for the courtesy, and the action is already receiving very pleasant notices in the papers throughout the State.

The Third Annual Convention of the Southwestern Electrical & Gas Association was held in San Antonio, May 14, 15, 16, and among the papers read was one by Mr. V. W. Berry, traveling car barn inspector for the Texas district offices of Stone & Webster, on "Labor Saving Tools and Devices for Tools and Car Barns." Mr. F. C. Randall, of the Galveston Electric Company, also read a paper on "The Getting Up and Trying Out of Forms." Likewise, many of the questions and answers in the "Question Box" of the Association were by Stone & Webster men of Texas, many of whom

were present at the Convention. Mr. H. T. Edgar, vice-president and manager of the Northern Texas Traction Company, Fort Worth, Texas, was elected president for the ensuing year by a unanimous vote. Mr. H. S. Cooper is the retiring president. Mr. Edgar makes the third successive president of this Association from the Stone & Webster ranks. In all respects—attendance, papers, question box, discussions, general interest and pleasure—the Convention was a decided success, and ranks as one of the best ever held in Texas. The meeting place next year will be El Paso, Texas, and a Stone & Webster property will be the host.

BATON ROUGE

The Baton Rouge Electric and Gas Company, which was taken over by Stone & Webster on February 14 of this year, owns the gas and electric plants and the street railway system in the progressive little capital city of Louisiana, which has about twenty thousand (20,000) population within the corporate limits, and three thousand (3,000) additional in the suburbs, as given by a recent directory.

Baton Rouge is one of the very old Southern cities. It was founded about 1719 on the left bank of the Mississippi River, one hundred and twenty (120) miles above New Orleans by river, and about sixty-eight (68) miles as the crow flies. Like a great many Southern cities, it has made wonderful progress during the last ten years; in fact it has made more progress in these ten years than it did in the one hundred and sixty years preceding. Being the State capital, it has been, more or less, a political storm center; for this reason, it probably suffered more during the reconstruction period which followed the Civil War than it otherwise would. During those days the city, and the parish as well, were burdened with debt which had been a handicap to the city's development. But those old debts are now rapidly being settled, and there remain only a comparatively small amount yet to be paid. Council a few years ago adjusted the remaining old claims against it with the creditors, on a low interest basis, and provided a sinking fund which is rapidly liquidating the claims.

During the last five years very nearly all the city has been sewered; six miles of streets have been paved; two magnificent school buildings and a City Hall have been erected.

The City is now absolutely on a cash basis, and with a bonded indebtedness of only Three Hundred Thousand Dollars (\$300,-

000.00), part of which has been pledged and set aside to purchase the water works plant, or to erect a new one at the expiration of the city's contract with the water company next year. There is no sentiment here in favor of municipal ownership of public utilities; but the city wishes to own the public water supply, in order to require all property owners to connect with the sewerage system.

Baton Rouge is justly proud of its progress during the last few years. But is certain of a much greater and more rapid progress in the very near future. The rich sections of country east and west of the city are, and always have been, inaccessible from this point. There have been no railroads into them, except by way of New Orleans, and the city has had no opportunity of doing business in them. But now three railroads are building into Baton Rouge through these sections, two from the west and one from the east, and a fourth one is being surveyed. The Colorado Southern, building from Beaumont, Texas, and the Southern Pacific from Lafayette, La., expect to complete their construction this summer, and the Baton Rouge-Eastern & Hammond, which is building from Nicholson, Miss., expects to complete its construction by January, 1908.

These roads will make the territory in which Baton Rouge merchants will be able to do business about forty times greater than it now is, as estimated by some of the city's most conservative jobbers. The fourth road, which is now being surveyed out to Birmingham, Ala., will, if built, give Baton Rouge access to the coal and iron fields of Alabama.

The converging of all these roads at this point, together with the enormous amount of property purchased by the railroads on the east and west banks of the river, gives strength to the belief that the Mississippi River will be bridged at this point.

The progress of the City since 1900 may be judged from the increase in bank deposits, post office receipts, and increased assessments.

BANK DEPOSITS.

January, 1900	 \$1,168,644.25
January, 1901	 1,335,342.71
January, 1902	 1,570,357.55
• .	
January, 1904	 1,785,477.77

January,	1905		1,741,606.54
January,	1906	• • • • • • • • • • • • • • • • • • • •	1,717,648.78
_			2.037.441.14

CITY TAX ROLL.

1900	 \$2,338,930.00
1901	 2,450,765.00
1902	 2,748,010.00
1903	 3,130,680.00
1904	 3,389,870.00
1905	 3,693,680.00
1906	 4,176,070.00

The assessments are supposed to be sixty per cent. of the value.

POST OFFICE RECEIPTS.

1900	 \$17,021.87
1901	 19,092.93
1902	 21,911.24
1903	 25,624.01
1904	 25,389.30
1905	 26,462.13

When all the property of the Baton Rouge Electric and Gas Company was taken over in February of this year by Stone & Webster, there was great rejoicing among Baton Rouge citizens, who felt that their prayers had been answered and that they would now have a system which they could point to with pride.

Stone & Webster have lost no time in their efforts to improve the system. New rails, new cars, and a new trolly line were ordered at once, as this portion of the system was most needed by the public.

Nearly all the new rails have been laid, and the new cars are expected daily. The gas and electric plants will be rebuilt as soon as plans have been perfected.

SAVANNAH

The recently opened exhibition department, arranged to promote this company's lighting business, has already demonstrated

the value of displays of electrical appliances of various kinds in stimulating the interest of the general public in electrical matters and in increasing their appreciation of the flexibility of electricity and its applicability to all kinds of business. The exhibition department occupies the ground floor of a three story block which the company has secured, in the center of the business section of the city, within a few steps of a junction point where nearly all street car lines meet. A new front has been installed in accordance with the latest show window practice, rendering available for exhibition and educational purposes very valuable window space, as well as ample floor space. The entire first floor, with the exception of the contract department headquarters and a small space at the rear used for the meter and trouble department, is gradually being filled with an assortment of heating devices, fixtures, small motor applications, sign samples, etc. The second floor of this building has been arranged to accommodate the general offices of the company, the third floor having been set aside, in part, for the quarters of the Employees' Benefit Association, which has heretofore used rooms at the car barn.

The Railway Department has recently taken several steps in the direction of the more modern development of street railway practice, its equipment up to the present time having been confined largely to older standard types. In order to get quicker service on its suburban lines, a number of four motor equipments of the new G. E. 81 type are being installed on the 15 bench open cars which have been standardized by the company for suburban resort business. These cars will also be equipped with air brakes of the General Electric Company's emergency straight air type. We believe that this is one of the first companies in the Stone & Webster group to adopt to any extent the General Electric Company's air brake apparatus.

The company is also building in its own shops four 15 bench open cars, to be used for the present as trailers. They will be equipped with air brakes, and may be run in two or three car trains in connection with the motor cars described above. It is believed that these cars, turned out from the company's own shops, show as thorough and careful workmanship as could be procured from any of the regular carbuilders. In fact, these are but samples of twenty odd cars of various types which have been built by the company's car shop force during the last half dozen years.

TAMPA

The year 1906 was the banner year in the cigar industry, the chief factor in the growth of this city. To sum it up briefly, the output for the year was 277,662,000 cigars, as against 220,430,000 the previous year, a gain of 57,232,000, or more than 25 per cent. The number of people employed had increased to more than 10,000, and the amount paid to them in wages was not less than \$8,730,000. These figures are beyond the easy grasp of the imagination, but they will stand the most careful analysis of the mathematician. Incidentally, the quantity of Havana leaf imported into this city during the year was 5,520,893 pounds, something like 25 per cent. more than was made up here. The average invoice of this leaf was slightly in excess of \$1 per pound.

The business has been hampered by such difficulties as the scarcity and high prices of the stock, occasional lack of workmen, and now and then a deficiency in the supply of boxes. The favorable circumstances have far outweighed these—consisting in the advent of several new and strong factories, the immigration of numbers of excellent workmen, a period of uniformly favorable weather, the utmost smoothness in the relations between the manufacturers and their employes, and a phenomenal spread of the reputation of and demand for the Tampa made cigar, which is now acknowledged to be without a superior, and almost without a rival in the world. What was modestly claimed a year ago, that Tampa was the leading point in the world for the manufacture of clear Havana cigars, is now an uncontested fact, admitted by every-This city makes and distributes more than one-third of the cigar output of Havana tobacco for the world. This gratifying condition is due to the ample capital and enterprise of our manufacturers, the number and skill of our workmen, and the perfect facilities for the distribution of the goods. That these conditions will continue, is clearly evident. The only visible limitation to the growth of this great industry in this city is the available raw material.

The weekly pay rolls of the cigar factories of this city are now aggregating above \$165,000 per week. This vast amount of money goes very speedily into every avenue of trade and business in the city, and accounts for the extreme activity shown by business generally.

PENSACOLA

More than twelve hundred miles from Boston, on the Gulf of Mexico, is one of the most enterprising cities of the South—Pensacola. Its land-locked bay, thirty odd miles in length and from three to six miles in width, with a depth of thirty-three feet at low tide, affords anchorage for all the navies of the world.

With railroads running direct from Chicago, Cincinnati and St. Louis, and with merchant vessels from foreign countries coming into the harbor, the export business has developed with remarkable rapidity in the last ten years, the increase amounting to 500 per cent. There is no city on the gulf coast which has taken greater strides commercially and industrially in the past decade than Pensacola. By the last census she shows a population of 32,000; with her four banks, twenty schools, more than thirty churches, with a new sewer system being installed, a new City Hall being built, and a large amount of paving laid out, she offers remarkable advantages to all who are looking for a good home and a good business location.

The Blount Building, a magnificent seven-story concrete office structure, has just been finished; the First National Bank building, a pure white marble edifice of one story, is hastening along to completion, and the Osceola Club's new home, an exquisite structure of pressed brick and Georgia marble, is in process of erection. In fact, throughout the city, on about every street, buildings of almost every class, but chiefly of substantial character, are being erected.

It is here that Stone & Webster saw a good field, and in May, 1906, they purchased the railway and lighting properties. The electric railway has over twenty miles of track and is serving a population of about 25,000. Important among the changes that have been made under the new management have been the electrifying of the road to Fort Barrancas, which made possible an hourly schedule in place of three or four trains a day, hauled by a dirty dummy engine. Other changes of importance have been the thorough reconstruction of all the cars and the thorough overhauling of all the tracks; in fact, the road has been made equal to any and second to none in the country.

The lighting department can also boast of many changes. A turbine has been installed, a new switchboard, a new railway unit; in fact, there has been a complete remodelling of the old power

station. New extensions to the light lines have been made, and are being made continuously.

The stores are fast coming to use electric lights, and the merchants have come to realize the value of electric signs. Already sixteen signs have been erected since December, 1906.

The heating and cooking devices are being put on the market rapidly, and in subsequent issues of this magazine will be given descriptions of the ways and means that have been used to develop new business.

TACOMA

The new line being built to Puyallup and Orting will be of great beuefit to the towns in the Puyallup Valley, and the half hour service which will be maintained when the line is completed in the fall will give the residents of Puyallup, Sumner and Orting excellent facilities for going to and from their villages and Tacoma.

The Puyallup Valley is one of the largest berry sections in the United States, and canning factories are being erected at Puyallup, new malleable iron works have lately been completed, and other manufacturing industries are arranging for permanent locations along the line between Puyallup and Sumner.

The Northern Pacific Railroad is bringing, on an average, about 1,000 people per day into the State of Washington, and many of these people are locating in the Puget Sound country. Many farmers are coming from the Middle West and taking farms of about 50 acres in the Puget Sound country, which they find are fully as, if not more productive than, larger farms in the Middle West. Lumber mills, dairies, raising of berries and garden truck are the principal industries of the residents of this section.

SEATTLE

The city of Seattle and its suburbs, on the shores of Puget Sound, have had, since the discovery of gold in Alaska in 1897, a most phenomenal growth and a continuing era of prosperity. The United States census of 1900 gave the population of the city as 80,671; conservative estimators today place the population of the city proper at 211,000. Several suburbs have recently voted to annex to Seattle, among others the city of Ballard, with a population of about 11,000, the city of West Seattle with 2,500, the city

of Columbia with about the same population, and a considerable territory continguous to the smaller cities above named; so that within three months the population will aggregate, it is expected, about 240,000.

Seattle is the chief financial center of the Pacific Northwest, its bank deposits having increased more than 1600 per cent. and its clearances 1000 per cent. during the past ten years. It has excellent public and private schools. It is the site of the University of Washington, where young people of both sexes can acquire a thorough education without leaving their homes. It has more than 120 churches and church societies, practically every known religious denomination being represented.

Across the Sound is one of the Government's navy yards, which is constantly being increased in the scope and ability of its work in handling repairs to vessels of the Government.

The merchants of Seattle practically control the trade of Alaska and the Yukon Territory, which runs into millions and is increasing annually.

Seattle is the center of a richly developed agricultural section in diversified farming, dairying and gardening. Great quantities of flour are milled in this city.

Very many large milling and logging interests make their headquarters in Seattle, and the lumber and shingle business of the Puget Sound territory is one of immense size and value.

The city will expend in 1907, it is estimated, more than seven million dollars in public improvements.

Seattle is beautifully situated scenically, fronting the waters of Puget Sound, backed up by the waters of Lake Washington, only two and a half miles east of the Sound, and being built as it is on its many hills, lending character and beauty to the city.

Its trade with the Orient is constantly increasing, especial attention being given by many of our merchants to this trade.

To meet the needs of this rapidly growing city and the immediate suburbs, the Seattle Electric Company has for the past seven years been constantly increasing its facilities and equipment necessary for furnishing light, power and street transportation. Stone & Webster as general managers have at all times exercised the most liberal judgment with regard to the company's needs, and it has been necessary to raise large amounts of new capital to meet the necessary expenditures for extensions and improvements. In 1907 a very large amount of new money will be expended along these

lines. More than forty miles of new track, in extensions, double tracking, etc., will be built; 11,000 Kw. of power generating machinery are now being installed in a new steam station at Georgetown, one of the southern suburbs; new shops and store houses in the same locality are being built,—all of reinforced concrete and of generous dimensions, the present shops and store houses of the company being very much over-crowded and outgrown. The company is also building, of reinforced concrete, a large sub-station at North Seattle and an Edison sub-station in the business district, and in West Seattle, across the bay, a brick substation, all with suitable equipment for the needs and uses to which they are to be put. New car barns of reinforced concrete are being built, one at Georgetown and one at North Seattle.

The addition to the car equipment for the year will be sixtythree 4-motor electric cars, double truck, 43 foot over-all dimensions, fourteen double truck trailer cars of the same over-all dimensions (now being received), eight new cable cars manufactured in our own shops, and eight flat cars for freight and construction purposes.

Much relaying of tracks and paving in districts to be improved by the city during this year will be undertaken by the company. In connection therewith the grades on Madison Street, James Street and Yesler Way cable lines in the business district are being considerably reduced in connection with the grading of intersecting streets. Third Avenue, which is to be a new retail street, is now being improved with a reduced grade and paving, new trackage and overhead construction, and probably will be ready for traffic some time during July.

The company has before it a considerable problem in planning for the throngs of people that will attend the Alaska-Yukon-Pacific Exposition to be held in this city in 1909. This Exposition is to exploit the mining, manufacturing and commercial interests of the Pacific slope, Alaska, the Yukon and the isles of the Pacific Ocean. The Board of Trustees of this Exposition, consisting of fifty of the representative business men of the city, is very earnestly at work along the lines of organization, and construction of the grounds and buildings will be begun during the month of June. With the characteristic push and energy of the Seattle people, it is felt that the Exposition will be a great success and the means of advertising Seattle and the Northwest in all parts of the civilized world.

FALL RIVER

As indicating that the competition of electricity with the gas business has had a stimulating rather than an adverse effect, the figures of growth of the Fall River Gas Works Company for the past six years are interesting:

The gas sales for the year ending June 30, 1900, were 169,251,157 cubic feet, while for the year ending June 30, 1906, the figures were 371,796,107.

The number of meters in use June 30, 1900, was 8014, which had increased to 16,669 on June 30, 1906, the consumption per meter for the last-named period being about 1200 feet greater than for the first-named.

The population of the city increased from about 105,000 in 1900 to about 117,000 in 1904; but, in consequence of the strike in the cotton mills in the summer and fall of 1904 it declined until the figures for May 1, 1906, were again practically the same as the census figures for 1900.

Mr. E. A. Davis, who has been employed by the Fall River Gas Works Company for about seven years as order and complaint clerk, has recently been promoted to the position of assistant treasurer of the Stone & Webster companies at Baton Rouge, Louisiana, to which city he moved with his wife about April 1.

BROCKTON

Work has been started on the erection of a new power plant for the Edison Electric Illuminating Company of Brockton, which when completed will be one of the finest equipped stations in the state.

In order to secure a site for the new station, where plenty of water for condensing purposes was available, the Company was obliged to locate in the neighboring town of East Bridgewater.

The new station will be located near a branch of the Taunton River, which constitutes one of the boundaries of the property recently purchased, and will extend along the line of the New York, New Haven and Hartford Railroad.

Land comprising an area of twenty-three acres has been acquired, allowing ample room for enlarging the station from time to time as the increasing business of the company demands.

Structural steel and brick with re-enforced concrete floors will constitute the material for the construction of the new station.

The stack will be 200 feet high and will be built of steel with a brick lining.

Sterling water tube boilers of 525 horse power each will be installed in the boiler room, which is to face the property of the railroad company, where a long siding and trestle is to be built for the proper handling and storing of coal.

Next adjoining the boiler room will be the turbine room, where there will be installed two 1500 kilowatt General Electric four stage steam turbines, to each of which will be connected one General Electric, three phase, sixty cycle, 13200 volt generator. A switchboard of the latest approved pattern and a twenty ton electric traveling crane, to facilitate the handling of heavy machinery, will also be installed in this room.

Engineers are now at work securing locations for a private right of way, on which will be erected a pole line for transmitting energy from the new station to a sub-station which is to be erected on the Company's property in Brockton, adjoining its present station.

The equipment of the sub-station will consist of three 200 kilowatt rotaries, three 375 kilowatt transformers, and a switch-board of the latest type.

The placing of all wires underground has been agitated for the past two or three years in the City of Brockton. To comply with the desires of the city fathers, the Edison Electric Illuminating Company of Brockton came forward and expressed its willingness to place its wires underground by petitioning the City Council of Brockton for permission to construct an underground system in the business district. This was granted, and work will soon be started.

Engineers are now at work securing locations for the proposed underground system, and when this is completed ground will be broken and the work rushed through to a finish.

PONCE, PORTO RICO

The sugar and cattle industries in the south of the Island are suffering from a severe drought, which has lasted for several months, injuring the cane crop for this year very materially. The coffee and tobacco crops, however, promise well, and, during the season just ended, we have introduced electric power for cleaning and polishing coffee in several plants here. We are promised a considerable increase in this consumption next season.

As general business conditions and the importation of lumber and merchandise are good, we look for a fairly good freight busi-

ness this summer, and expect that it will increase in the fall. The Lighting and Railway Departments are showing substantial gains, both power sales and freight receipts having trebled.

During the year 1906 the Company installed a new 150 K. W. G. E. alternator direct connected to a McEwen engine, to take care of increased load. In 1907 we shall add the following: New water tube boiler with accessories, and a water softening plant; two motor flat cars for freight and coal hauling; new sidings on main line to allow for increase in passenger service.

A franchise has been secured from the Insular Government for the building of a wharf, and we propose to make immediate application to the Secretary of War for a permit to build the same and do the necessary dredging. Our railway franchise has also been amended to allow extending the tracks to the site of the proposed wharf.

On June first Mr. Herbert S. Whiton, now Chief Engineer, was promoted to the position of Manager, vice Mr. Gardner Rogers, who is leaving for the Boston office. On the same date, Mr. James B. Walker, of the treasurer's office in Boston, was appointed assistant treasurer vice Mr. William H. Stone, who is leaving the company to become manager of the Mayaguez Light and Power Company of Mayaguez, Porto Rico.

SYDNEY, CAPE BRETON

The business outlook this spring in the Sydneys and Glace Bay is extremely promising. A number of the local companies are increasing their output considerably; and several others are reorganizing, putting in more capital, and making extensive enlargements in their plants. The Dominion Coal Company, operating in Sydney and Glace Bay, expects to increase its output this year considerably over previous years.

The Nova Scotia Steel & Coal Company, operating at Sydney Mines, is also increasing its output from the old mines, and has commenced to take coal from a new mine it has just opened. It is also at work getting ready to open up a new mine in the Point Acon district.

The Dominion Iron & Steel Company is doing a good business and has a large amount of orders on hand. It has just started in operation a "Bessemer" plant, which will increase its output approximately 30,000 tons per month. This is the first of its kind in Canada, and has been a distinct success from the start. This

company is well in the lead as the greatest iron producing plant in Canada.

The Sydney Foundry & Machine Works has recently been re-organized as a stock company with an authorized capital of \$100,000. James Clark, Sydney, is president, and Wilfred E. Clark secretary and treasurer. This business was founded nineteen years ago, and in 1901 was taken over by Mr. James Clark. Under his management the business has expanded rapidly, and has outgrown its present capacity. It is the intention of the company to enlarge its works, and install a boiler and structural iron shop. It will also install a "Torpenas Convertor" for the manufacture of steel castings, which will give the company the distinction of being the only plant east of Montreal manufacturing steel castings. It is operating the present plant with electric power supplied by the Cape Breton Electric Company. The Electric Company is also figuring for its requirements for the new plant, which will require individual motors, approximating 115 H. P.

Another change worthy of note is the re-organization of Shaw & Mason, one of Sydney's leading business firms, into the Shaw & Mason Co., Ltd. Shaw & Mason have been engaged in the tinware and roofing business for some years. The new company is already preparing to erect buildings, which will comprise offices, pattern shop, tin shop, metal shop, machine shop, brass finishing shop, brass and iron foundries. All kinds of tin and galvanized iron and copper ore will be manufactured.

In the iron department steam fittings, steam and water valves, soil pipe fittings, stoves, hot air furnaces, and hot water boilers will be manufactured. The McDonald patent lock nut plate for fish plate bolts will be one of the main features of the iron department.

In the brass department there will be produced brass castings of all kinds, valve fittings, plumbing supplies, and a specialty of ships' brass work. The company expects to be in operation about the first of September. The Cape Breton Electric Company is to supply it with 25 or 30 horse-power in electric motors.

The Cape Breton Electric Company is commencing work on a high voltage transmission line between its Sydney and North Sydney power houses. The transmission line will be approximately fourteen miles in length. It is the intention of the company to erect a new power house at North Sydney and to install a motor generator set, doing away with steam generation. This change will effect a considerable saving in the operating expenses of the company.

QUOTATIONS

ON

SECURITIES OF PUBLIC SERVICE CORPORATIONS

UNDER THE MANAGEMENT OF

STONE & WEBSTER

JUNE 1, 1907

NOTE:—Quotations are approximate. Unless indicated to the contrary Bonds and Notes are \$ per cent and preferred stocks 6 per cent non-cumulative. Bonds are sold plus accrued interest.

COMPANY		BONDS	PREF.	COM.
Blue Hill Street Railway Co., The		100	No pref.	
Brockton & Plymouth St. Ry. Co.		100	No pref.	• • • •
Cape Breton Electric Co., Ltd.		90	83	 25
Columbus Electric Co.	-	94		• • • •
Columbus Power Co., The	Notes	96 95	2	16
Dallas Electric Corporation	14	98	70	26
Edison Elec. Ill. Co. of Brockton	Notes	100 100	No pref.	••••
El Paso Electric Co.	12	97	95	50
Fall River Gas Works Co.		No bonds	No pref.	285
Galveston Electric Co.		98	90	41
Houghton County Elec. Lt. Co.	-	100	23	16
Houghton County St. Ry. Co., The	-	90	95	25
Houston Electric Co.	9	99	90	41
Jacksonville Electric Co.		100	99	90
Key West Electric Co., The		• • • •	2	••••

COMPANY		BONDS	PREF.	OOM.
Lowell Elec. Lt. Corporation, The		105	No pref.	195
Minneapolis General Elec. Co., The		104	108	100
Northern Texas Electric Co.		98	82 11	39
Paducah Traction & Lt. Co.	11	90	60	18
Pensacola Electric Co.		95	871/2	25
Ponce Electric Co.		100 7	No pref.	••••
Puget Sound Electric Railway	Notes	100 943⁄4	91	55
Puget Sound Power Co.		102	No pref.	1
Savannah Electric Co.	9	98	83	16
Seattle Electric Co., The	13 Notes	10 3 100	98	86
Tacoma Railway & Power Co.		100	No pref.	- <u>1</u>
Tampa Electric Co.		No bonds	No pref.	183
Whatcom County Ry. & Lt. Co.	•	95	88	48

^{1.—}Cumulative. 2.—No dividend yet paid. 3.—Bonds of Northern Texas Traction Co. 4.—5 per cent. 5.—Cumulative after Dec. 1, '07. 6.—1 per cent paid Dec. 1, '06 and June 1, '07. 7.—6 per cent. 8.—Par \$25. 9.—Listed Boston and Louisville. 10.—Listed Boston. 11.—Listed Louisville. 12.—Listed Columbus, Ohio. 13.—Listed Boston, Columbus Ohio, Louisville. 14.—Listed Louisville, Columbus Ohio, '15.—Held by Seattle Electric Co. 16.—Held largely by Columbus Elec. Co. 17.—Held by Puget Sound Elec. Ry. 18.—4½ per cent.

STONE & WEBSTER

Securities Department

OFFICES:

Boston - - - 84 State Street Chicago, 604 First National Bank Bldg.

NOTE. — The Securities Department handles securities for those wishing to purchase or sell, keeps accurate quotations, and gives out information about above companies.

COUPONS AND DIVIDENDS DUE

	Per	cent.
July 1st, Cape Breton Electric Co., Ltd. 5's	1932	2 1-3
July 1st, Columbus Electric Co. pfd. stock	6 per cent.	3
July 1st, El Paso Elec. Co. 5's	1932	2 1-3
July 8th, El Paso Elec. Co. pfd. stock	6 per cent.	3
July 1st, Houghton County St. Ry. Co., The, 5's	1920	2 1-2
July 1st, Houghton County Elec. Lt. Co., 5's	1927	2 1-2
July 1st, Lowell Elec. Lt. Corp., The, 5's	1914	2 1-2
July 1st, Puget Sd. Elec. Ry. pfd. stock	6 per cent.	3
July 1st, Savannah Elec. Co., 5's	1952	2 1-2

JACKSONVILLE ELECTRIC COMPANY

On May 27th the following notice was sent by the Board of Directors to the stockholders of the Jacksonville Electric Company:

For several years your Company has been operating under conditions imposed by the charter of the City of Jacksonville, which practically prevented the extension and development of the railway system, and the General Managers have been working for some time upon a plan by which such restrictions could be removed. We are glad to report that their efforts have been successful.

On April 16, 1907, the citizens of Jacksonville by a referendum vote ratified an ordinance previously passed by the City Council and approved by the Mayor, granting a new franchise to your Company. This franchise gives the right to consolidate all existing street railway lines in Jacksonville, to make certain important extensions, and to operate all lines subject to the terms of the new franchise for a period of twenty-five years. It provides for a franchise tax of three per cent. of the gross earnings of the railway lines, and also for a contract with the city by the terms of which the present lighting franchise (which would have terminated in 1911) is surrendered and the lighting business conducted for four years for and in behalf of the city, your Company retaining eighty per cent. of the gross receipts to cover expenses, charges and profit. The city has agreed to purchase, at the ex-

piration of this contract, all outside lines and equipment used for lighting at a fair appraised value.

The arrangement above outlined overcomes the restrictions upon the Company resulting from the provision in the charter of the City of Jacksonville which stipulates that the city shall not grant any franchise or extensions of franchises to public service corporations doing an electric lighting business in competition with the city. Your Company, by surrendering the lighting franchise, is no longer in competition with the municipal lighting plant, and is in a position to extend its railway system from time to time to meet the growth and demands of the city.

The gross earnings of the Lighting Department of your Company for the year ending December 31, 1906, amounted to \$64,065.58, and it is expected that the gross revenue of the lighting business conducted for the city will continue at about the same figure for the four years covered by the agreement.

The advantage to the Company of being in a position to extend its lines to keep pace with the growth of the city, and being able to consolidate all the railway lines and thereby effect economies in operation, is a most important one, and will far more than offset any losses due to the ultimate relinquishment of the lighting business. In our opinion the position of the Company is greatly strengthened by the new franchise.

NEW CHICAGO OFFICE

During the early part of May, 1907, a branch of the Securities Department was established in the First National Bank Building, Chicago. This office will be in charge of Mr. Arthur J. Veitch, who for the last six years has been associated with the banking house of Messrs. Peabody, Houghteling & Company, of Chicago.

The object of this new office will be to develop in Chicago a business in the securities of the Companies under our management. Particular attention will be paid to preferred stocks.

STONE & WEBSTER

84 State Street, Boston

GENERAL MANAGERS OF

The Lowell Electric Light Corporation
The Seattle Electric Company
Puget Sound Electric Railway
Columbus Electric Company
Cape Breton Electric Company, Ltd.
El Paso Electric Company
Jacksonville Electric Company
Ponce Electric Company
Northern Texas Electric Company

The Minneapolis General Electric Company
Edison Electric Illuminating Co., of Brockton
Houghton County Electric Light Company
Brockton and Plymouth Street Railway Company
The Houghton County Street Railway Company
Whatcom County Railway and Light Company
Savannah Electric Company,
Dallas Electric Corporation
Paducah Traction and Light Company

The Blue Hill/Street Railway Company
Fort Hill Chemical Company
Tampa Electric Company
Terre Haute Traction & Light Company
General Electro-Chemical Company
Houston Electric Company
Fall River Gas Works Company
Galveston Electric Company

STONE & WEBSTER PUBLIC SERVICE JOURNAL

AUGUST, 1907

EDITORIAL COMMENT

If the editor felt that he was entitled to any of the credit for the first number of the Stone & Webster Public Service Journal. he would preserve a decorous silence. But his own share in that work was so small that he can voice his satisfaction without shocking his modesty. There is no denying the fact that the magazine made a favorable start. The awkwardness of youth was not painfully evident. Indeed, a mannish air was assumed with no small degree of success. Frankly, for a first number it was a decidedly encouraging production. The editor would put it even stronger, were it not that he cannot wholly forget that he speaks as the representative of the men of the Stone & Webster organization, and must therefore be governed by a vicarious if not by a personal modesty. He does not hesitate to say, however, that he was delighted, not only over the generous co-operation of the men of the organization, but also over the carefulness and skill with which they made their co-operation effective. The new project was launched without a wrench, and it took the water in a way to encourage the hope that it will be equal to any kind of sea. satisfaction with the first number springs not so much from what it was in itself, though we are justly entitled to satisfaction on that score alone, as from the indication which it furnished of the zeal

and latent journalistic capacity of the men of the Stone & Webster organization.

Henry G. Bradlee, who became a member of the firm of Stone & Webster July 1st, was born in Boston, January 25, 1871. He attended Chauncy Hall School and was prepared there for the Massachusetts Institute of Technology, which he entered in 1887. He was graduated in 1891 as an electrical engineer, and within two days of graduation entered the employ of Stone & Webster.

He spent the summer of 1891 in the Drafting Room, and the next year in the Laboratory testing cables, calibrating instruments, etc. For several years after this Mr. Bradlee had charge of the isolated plant work for the firm. They were at this time doing much engineering and supervision of construction of plants of this sort including plants of some size at the Massachusetts State House, at the Boston City Hospital, Exchange Club, and many city institutions and private buildings.

Stone & Webster bought the Tampa property in the fall of 1899, and in October Mr. Bradlee went there to manage the Company until everything was well under way. He stayed there until June, 1900, when he returned to the Boston Office and became a member of what was known then as the Operating Committee, consisting at the time of W. Cameron Forbes, Russell Robb, and Henry G. Bradlee. This Operating Committee finally became the Stone & Webster Executive Committee, and had added to it all of the men who are now "sponsors" for the different properties.

Mr. Bradlee became Chairman of the Executive Committee in January, 1905, when Mr. Robb became a partner in the firm.

For nearly two years the National Civic Federation has been investigating the public and private operation of the four leading public utilities, gas, water, electric lighting and power, and street railways. At last it has begun to make known the results of its

research. Two reports have recently been issued, one by Prof. John R. Commons of the University of Wisconsin, the other by J. W. Sullivan, editor of the Clothing Trades Bulletin of New York. We do not propose to discuss these at this time. To one fact we do desire, however, to call attention, namely, to the fact that these two gentlemen appear to have reached quite different conclusions. Prof. Commons seems very favorably inclined to municipal ownership, while Mr. Sullivan frankly classifies such ownership under the head of "Utopian schemes." So far, therefore, as these two reports are concerned, the general public are left as much in doubt as before.

This is not surprising. For there is one factor in the problem which scarcely anyone has taken sufficiently into account. That factor is the well-known law of "the division of labor." For centuries, human enterprise has tended powerfully in the direction of specialization of effort. Advocates of private ownership will claim that private ownership represents precisely that thing; and it is fair to contend that the burden is on the advocates of public ownership to prove that it does not. If they can establish the proof, they will do more to advance their cause than anything they have yet done. We do not for a moment assume that the advocates of municipal ownership will declare that the law of specialization has lost its force and meaning. They will be as quick as anybody to maintain that it is a valid law of human nature which cannot be ignored with impunity.

They will probably contend that municipal ownership is no violation of the law of "the division of labor," or, stated otherwise, the law of specialization. They will be pretty sure to point to the great private industrial combines as exemplifying exactly the same policy which underlies municipal ownership of public utilities. Take, for example, the United States Steel Corporation. This combine has gathered together a vast number of apparently diverse industries under one management. Now, it may be asked, is not this flying right in the face of the law of specialization? Apparently, yes; actually, no.

The fact is, there is no loss of specialization by reason of the Steel Corporation. Each of the different industries taken over by the combine is conducted with all the concentrated attention that it received when an isolated enterprise. It loses nothing in specialization by combination, and it gains much from a better co-ordination with the other types of industry with which, in the very nature of things, it is bound to have reciprocal relations. But the advocates of municipal ownership will ask if all this is not equally true under their policy. That is for time to demonstrate, though we are not sure that, even at this stage of the controversy, it would be rash to assert that one or two very marked differences can easily be distinguished between the two situations.

* * *

The Steel Corporation represents unity in diversity. The unity involves the loss of nothing that is essential to diversity. The diversity still exists, in the sense that each of the constituent industries is subjected to even higher specialization than formerly, and is regarded as entitled to a place in the combine only as it contributes to the profit of the latter. There is no place for dead wood in an industrial combine. Each part must pay its way or be discarded. Does all this hold true of a municipality which takes over the ownership of its public utilities? Is it not held by many that municipal ownership is a good thing even if the utilities are managed at a loss? The public utilities are co-ordinated with the whole activity of the municipality, and certainly in not a few known cases the idea of diversity has been weakened.

* * *

Some will claim that this does not matter. They will say that there is no real reason why each constituent part of the activity of a municipality should be treated as a commercial problem. Why not frankly reduce public utilities to the category of the police, the fire department, and the schools? It is well, however, to ask if they naturally fall under this classification. The police and fire departments are indispensable to the protection of life and property,—without them a municipality would soon be reduced to chaos. The schools are equally indispensable to the safeguarding of the liberties of the people. Necessity knows no law, and all of these features of municipal life we must have, even if to have them

means great hardship. None of these functions can safely be delegated to private enterprise. If any of them could be, the expediency of so doing might, for strictly commercial reasons, win general assent.

* * *

It may be questioned if American common sense will ever tolerate the view that what are known as "public utilities" are entitled to be classified with the police, the fire department, and the schools. In the long run, the public will be pretty sure to insist that there shall be no co-ordination of the public utilities with the total activity of the municipality, except such be strictly analogous to that co-ordination of highly specialized diverse units which characterizes the private industrial combines. The law of specialization, it seems to us, has been at work too long, and its results have been of too great benefit to mankind, to admit of a permanent reversion to a primitive type of paternalism.

Democracy and Public Service Corporations

No one will seriously contend that democracy is not the highest development of human government. Yet for this very reason it is the most complicated, the most difficult form of government. It is to autocracy what a Corliss engine is to Watt's teakettle. The Corliss engine is of immensely greater benefit to the world; because along with the increase in inventive skill which has produced it, there has been a commensurate increase in the knowledge and skill of those who use it. The adjustment has been perfect. Eventually, let us hope, there will be an equally perfect adjustment between the democratic form of government and the individuals who employ it. Obviously, adjustment in this case is a much more difficult feat than in the other, because the element of human nature enters here, the most intractable of all the elements involved in the problem of human affairs.

It would be folly to ignore this fact in studying the relation of public service corporations to the public. The increased dignity of human nature is registered by the increased participation of "the public" in political government. Real democracy had its birth in the United States. For practical purposes, we may fix the date at the beginning of the War of the Revolution. That seems a long time ago; yet it is a very brief period, compared with the untold centuries during which "the public" were without political power. It is altogether too brief a period for a perfect adjustment of the mass of mankind to the true idea of democratic government. There need be no false modesty on this point. The most intelligent men are the quickest to recognize their limitations as members of self-governing communities. This would have been true enough a century or more ago, when the problems of government were simplicity itself compared with those of today. Government is now occupied chiefly with economic questions of a kind to tax the acutest intellect.

All men are by instinct prone to prefer the good of the moment to the larger good which comes with time. Yet it is one of the chief functions of government to subordinate the former to the latter. In our moments of highest patriotism we all recognize this. But everything conspires to keep us from living on high altitudes of political thought. The political questions of a century ago made no such direct appeal to the average man as do the economic questions with which government now concerns itself. The incentive to hasty and ill-considered action is one hundred per cent. greater.

But the danger from hasty and ill-considered action is more than one hundred per cent. greater. Economic law is inexorable. It knows no mercy. Break it, and no amount of repentance will avert the full consequences. Hence a democracy, more than any other form of government, can do no better than adopt for its own that fine maxim of the Romans, "Make haste slowly." It has been said on high authority that no question can be considered settled until it is settled right. On its face, this is a comforting assertion; but careful reflection will show that it is not altogether free from speciousness. It may be a sound doctrine when applied to moral issues, for moral issues are always simple. The obvious implication of the maxim is that it is perfectly possible for all questions to be settled right provided men are honest; but this is by no means true of economic questions. Such questions are not simple, but, on the contrary, very complex. If settled right at the start, well and good; but given an initial error, especially if continued for any length of time, it may not be possible, by the subsequent application of sound principles, fully to effect a right settlement. The economic sins of the fathers are visited on the children far beyond the third and fourth generation.

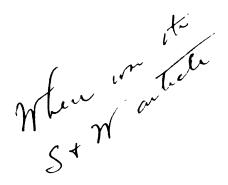
The average man rules in a democracy; and it is no disparagement of the average man to say that he is weak in his economics,—he has that failing in common with the man far above the average. Economics is a dry science; few persons have patience to master its principles, and many who do succeed in mastering them are impatient at the restraints imposed by them. Yet economics is to the industrial life of the nation what mathematics is to book-keeping or to navigation, two highly practical pursuits. The average man has proper respect for every science except the science of economics. For the settlement of economic questions he is apt to believe the rule of thumb sufficient.

We have seen this illustrated time and again. Twenty years ago, if you mentioned Gresham's law to the average man, more than likely he laughed at you for a doctrinaire. Yet it was indifference to that law which produced the panic of 1893 and four years of the hardest times ever known in this country. But the disregard of Gresham's law twenty years ago was no greater than the disregard so evident today of another great law, namely, that capital will instinctively and inevitably seek those pursuits which insure it the largest return and the least hindrance. There is quite as much danger now that capital will be diverted from its natural channels, as there was twenty years ago, or less, that gold would be diverted from its natural channels.

This brings us to the specific point which we have in mind, namely, the relation of public service corporations to the public, or, better still, the relation of the public to the public service corporations. From present appearances, this is the greatest economic question that will confront the people of the United States in the next decade. It is certainly the most complicated question that has ever presented itself for governmental treatment. If this nation reaches a wise solution of the problem, that certainly will be the most triumphant feat of democracy. Indeed, the problem may be considered the final test of democracy.

It is incumbent, therefore, upon every American to approach the question of public service corporations with modesty, disinterestedness and courage; with modesty, because it is the most difficult question with which he, as a component part of this government, has ever had to deal; with disinterestedness, because upon his answer will depend, in very large measure indeed, the future character of American civilization; with courage, because he will very likely-find it necessary to pit reason against passion.

It follows, of course, that a peculiar duty falls on those who have made public service corporations the study of their lives. In fact, it should be their part to explicate the public service corporations to the public; and this is particularly true of the men in the Stone & Webster organization. The task is not one that calls for oratory, for precept must be upon precept, precept upon precept, line upon line, line upon line, here a little and there a little.



STONE AND WEBSTER ENGINEERING COR-PORATION

BY HOWARD L. ROGERS.

This corporation is the result of evolution. In the early days of Stone & Webster's career the construction work handled from the Boston office was almost entirely in connection with properties in which their interest was new. It consisted of important extensions in connection with consolidations and rearrangements of existing physical properties.

The method of handling it was to design in Boston the more important items of the work and then to turn the plans over to a competent man, send him out on the field and let him alone to finish up the work as he saw fit, furnishing him with funds as he needed them. Under this method the work did get done, but in the meantime the Boston office was very much in the dark as to its progress and as to its cost.

The difference between the personal equation of a good constructor and that of a good engineer was very soon realized, and also the fact that neither of them had any particular faculty for keeping the Boston office properly posted on what he was doing. Such reports as were sent in, instead of going through definite channels, were handled through various individuals, and the methods of reporting and accounting were made to suit these individuals and were different for each job. One result of this was that even if reports and costs were properly kept, no two jobs were on the same basis, and the data accumulated was of little value for future work.

Our men at that time were principally engineers, and for this reason the bulk of the work was sublet, very little work being done on force account until about 1903. Then, partly in order to systematize reports from men in the field and the general methods of conducting this class of work, the Columbia Improvement Company was organized and was, for a time, considered as the Con-

struction Department. This plan was a step in advance, but the Columbia Improvement Company, the Engineering Department and the Purchasing Department, all of them necessary factors in the construction work, reported through different channels to the Stone & Webster headquarters, and there was a lack of close co-ordination between them.

About a year ago it was decided that these three departments should be brought under one definite supervision, and to accomplish this result, the Stone & Webster Engineering Corporation was organized. Mr. D. P. Robinson, who was then at the head of the Engineering Department, was elected vice-president and general manager, and Mr. H. L. Rogers, who was treasurer of the Columbia Improvement Company, was elected treasurer of the Engineering Corporation. The Construction Department was organized as an entirely distinct one, and Mr. G. O. Muhlfeld, who had been in charge of the development at St. Croix Falls, was made Construction Manager. Mr. W. N. Patten, who had been Mr. Robinson's chief assistant in the Engineering Department, was made Engineering Manager.

The construction work done by this office has been very rapidly increasing. The corporation occupies a whole floor at 84 State Street, and the area of 8,000 square feet does not nearly take care of the present needs of its Boston office. The Boston payroll covers 187 men and amounts to \$260,000 a year. This amount includes men actually in the Boston office and the superintendents and accountant at the fifteen district offices now operating. The payrolls of these fifteen district offices amount to over \$1,000,000 a year. The corporation expended on construction work during the year ending May 1 over \$4,800,000, and has now on its books agreements calling for the additional expenditure of \$4,000,000.

A chart of its organization is given herewith.

The main reason for this corporation's existence is to keep together for the benefit of the Stone & Webster Companies an organization of men specially trained in all the various branches of engineering and construction work. It aims to reach a position where it can take charge, for any company on the Stone & Webster list, of any construction or reconstruction work, however large or however small, acting for and under the direction of the manager, relieving him of all detail in connection with the work, and finishing it up quicker and at less expense than the manager could do it himself.

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It is appreciated that work which the corporation can secure from people outside the Stone & Webster list will have value to the Stone & Webster Companies in several ways. In the first place, it will put the corporation in touch with other peoples' ideas as to proper methods of design and construction. It will enable them to still further specialize the various departments and the personnel of these departments; in fact it is almost an axiom that the larger an organization of this sort is, the more efficient and the more flexible it is. While this statement applies more particularly to the Engineering and Construction Departments, a similar argument holds good for the Purchasing Department. The volume of orders which they place in connection with construction work for our own companies or for outsiders gives them a grip on market conditions which is exceedingly valuable to our companies in connection with their ordinary operating orders.

The corporation has recently taken up work for the Boston Elevated Railway Company amounting to \$2,250,000 in connection with three important power station extensions, and its organization has now reached a stage where it can reach out and actively hunt business from outsiders. Any help that company managers can give in securing outside work for the Engineering Corporation will tend to strengthen the organization and so indirectly benefit all the companies.

The Stone & Webster companies are constantly undertaking comparatively small jobs of construction or reconstruction. The corporation can do many of these jobs with distinct advantage to the company concerned, and any increase in its total volume of business by reason of such work will have the same incidental advantage to the companies collectively as work done for outsiders, that is, an improvement in the flexibility of the corporation's forces.

SIMPLE ELECTRIC LIGHTING RATES

BY AN EX-MANAGER.

The electric lighting business is a peculiar one. It cannot manufacture its product and store it against future use as a gas company, and in fact any other manufacturing company, can, but it must manufacture "on the spot" the amount of current that any customer may demand at any instant, or the amount that any number of customers may demand at any instant.

It stands in a business class by itself, and many systems of rates have grown up, all more or less scientifically recognizing the difference between this industry and others. These rates try to take into consideration, among other things, that there are not more than one or two hours out of the whole twenty-four that the plant is working efficiently.

From the peak of the load, or the period of the day during which the greatest number of customers are demanding the greatest amount of service, the efficiency of the plant dwindles as the demand for service falls off to sometimes nothing, as in the case of those companies that shut down absolutely during certain hours.

The money invested in the plant is working only while the machinery is, but the charge for the use of the money or the interest goes on without stopping.

A customer who desires service during leisure hours can be served at less cost than he can be during rush hours, because the company is simply selling him the use of plant power that would otherwise lie idle, and, as before stated, the charge for money invested in the plant to produce that power is going on whether or not it is sold.

A, demanding service for one hour at 7.00 P. M., assists in compelling the company, whose works are already up to their full capacity, to install additional apparatus, thus adding more fixed charges, while B, demanding the same kind of service at 10 A. M., increases the efficiency or load factor of the existing plant. The

average electric light company, if it were possible to arrange its load so that it would be uniform, could increase the service sold by it four-fold.

The managers of these companies, in their endeavor to fix rates that are in harmony with conditions, have found that the public does not understand the necessity for such apparently complicated prices, and of late there has arisen a popular demand for simple rates.

Can a simple uniform rate be made without endangering or injuring the business?

There are uniform simple rates made for public service where many different factors are leveled, as in the five-cent street car fare, this rate being charged at all hours and for varying distances; but it should be observed here that, while the characteristics of the fixed charge closely resemble those of an electric lighting company, the "operating cost" is seen in an entirely different aspect.

The cost of operating a car is not substantially greater with a load of 20 passengers than with a load of 10, but let it be imagined that each additional passenger adds to the operating cost in the same proportion that additional service adds to the operating cost of an electric light company, and it is plain that the five-cent faremust be changed to several rates, or largely increased.

The lighting company would be in a position somewhat like that of the street railway company if all its line transformers consumed current up to their capacity whether or not any customer burned his lights. The transformer would be like the car—they must be run—and the more consumption of current or passengers carried up to their capacity, the greater relative profit.

The telephone rates are more simple than the maximum demand or sliding scale rates of electric lighting companies, in that most of them are what is known as flat rates, and there is no differentiation depending upon the time of demand for service.

The condition here is the exact antithesis of that in street railway work, because each additional service increases the ratio of operating cost; or, in other words, each additional subscriber not only increases the cost of operating in himself but adds to the cost of serving every other subscriber.

A telephone company, however, has a "long peak." Its load is fairly steady during business hours, which means about eight hours as compared with not over two hours for a lighting company, and,

in addition, the demand of the customer has some elasticity—viz., if a line which he desires to use is busy, he must wait.

Therefore, imperative and instantaneous demand for service with short peak loads is a condition the telephone companies do not have; but its problem of compensation for increasing operating cost is one that electric light companies do not have.

Telegraph companies recognize the advantage of selling service "off the peak" by making lower rates for night messages; but their rates are simple, and so is the problem of giving service. A message is sent when the operator reaches it in regular order, and not while the customer writes it. The demand is not "instantaneous and imperative," nor does the greater number of customers demand service within a certain hour each day.

It would be possible to continue this list of public service industries to a great length; but none could be found that calls for so many different scales of prices, in order that each customer shall be charged on exactly equitable basis, as does the electric lighting business. And this, from a purely logical standpoint, would justify the existing complicated methods of charging for electric current. But there is a great reason why it is very desirable to simplify lighting rates from a standpoint of business policy; and that is, because the public does not understand them and cannot be taught. For it will take neither the time nor the trouble to learn; nor can it reasonably be expected to do so.

Until we reach the millennium of socialism, men will insist that in a trade the most important thing to the buyer is what the commodity costs him, and not what it has cost the seller. When the buyer knows that several offer the commodity in competition, he feels quite easy that the price is fair.

Now comes the monopoly suspected by the buyer to exist for the sole purpose of larger profits, offering its wares by a complicated price list and actually explaining to the customer somewhat as follows:—

"The first rate you pay is interest on our investment in plant; the next is because you want service when we are busy; and the next because I am not quite so busy; and so on." Now every one of these reasons is a perfectly good one upon which to calculate a price; but it should never be brought to the attention of your customer, unless you wish to impress him with the idea that he is guaranteeing the lighting company against loss.

It is impossible for an electric lighting company to educate the general public in the theory of "standby costs," etc., without at the same time teaching it a lesson in municipal ownership. It reasons thus:

"If the circumstances surrounding this electric lighting business require us to guarantee the owner of it a profit and require us to protect him against ordinary business chances that we ourselves take in our lines of business, and it is something we need, then surely this is a proper industry to be taken over by the people."

It is not probable that simple electric lighting rates are a panacea for all the troubles of electric lighting companies, but they will undoubtedly remove at least some of them; and, other things being equal, the company that has the simplest rates will have the least trouble. Notwithstanding the electric lighting industry has a more serious task than any other public service in the establishing of a simple rate, and in the levelling of many different factors, the time may arrive when there will be generally established a flat rate, which will be classified into different kinds of service, such as residence, offices, stores, etc., and this rate may be based upon the number of lights installed, with perhaps some device for the automatic limiting of current to a certain amount. The electric light manager will then have only to convince his customer that the price is not exorbitant,—that he is furnishing light as cheaply as it is furnished in other cities under similar circumstances. The customer will be relieved of the monthly impression he receives that his meter is not only wrong, but designed to be wrong, and that it registers just as much whether he shuts his house up and goes away for two weeks or whether he stays at home and entertains every evening; that customers do believe these things, any one who has had any experience in the lighting business knows; and a constant repetition of circumstances under which the customer thinks he is being cheated—and such circumstances do constantly occur—tends to build up an antagonistic public feeling.

It is admitted that flat rates are unscientific, that there is greater difficulty in arriving at a proper rate, and more chances for bad judgment. But the effect on the public mind makes their adoption "good business"; and lighting companies are in "business," not mathematics.

THE DEPOSIT SYSTEM FOR COLLECTING LIGHTING BILLS

BY C. W. KELLOGG

We have in operation in El Paso a system of insuring ourselves against bad debts which combines, with unusual success, the two desiderata which often conflict in the lighting business, namely, the desire on the one hand to make it as easy and simple as possible for a new customer to get connected to our system and the necessity on the other hand of getting cash for the service rendered.

We have found by past experience that the El Pasoan is slow to sign a contract; the necessity for such a procedure, as a condition precedent to getting lighting connection has proved no small deterrent factor, from the prospective customer's point of view and no inconsiderable expense, from the Company's view point, in getting contracts signed up.

To insure payment of bills, we simply collect a cash deposit from each new customer (unless he is known to us or is a city official or some other person entitled to special consideration) of about the estimated amount of one month's bill. We explain to every person from whom a deposit is taken that we pay 6 per cent. interest on deposits and that the Company wishes the deposit simply as a business precaution, because goods are delivered and used up beyond the power of recovery before bills are presented.

This procedure in connection with taking on a new customer is followed up each month by the following system. Each customer receives a monthly bill in the usual way, allowing him ten days from its date in which to get 10 per cent. discount. In case the account is not settled in fifteen days from its date, a polite notice is mailed, calling attention to the unpaid account and asking settlement. If this fails to produce the desired result, in five days more a "cutout" notice is sent to the customer, stating in civil



terms that if his account is not settled in full at our office by a certain date, we shall be obliged to discontinue furnishing him current. If this notice fails to bring a settlement of the account, the matter is turned over to the meter department to cut the customer out; but the man who goes to disconnect the service takes a bill with him, in order, to allow the customer to pay it before being cut out, if he or she desires to do so. The customer is thus given four different opportunities to pay his account before actually being cut out.

This has resulted in cutting our bad accounts down to onequarter per cent. of our gross earnings in the lighting department, and has in no case caused a customer to feel that he has not been dealt with in an exceptionally fair manner by the company. It has also cut out the greater part of the usual collection expenses of most lighting companies, as we always charge fifty cents for reconnection to a customer once cut out for non-payment.

HOW TO INCREASE THE EFFICIENCY OF THE RETORT HOUSE FOREMAN

BY A GAS SUPERINTENDENT

The most important question that presents itself to the superintendent of a Stone & Webster gas works is—How to get a workman to give his work the best there is in him. The design of the manufacturing apparatus, the coal used, local conditions and a dozen others, all play an important part in the total process of gas manufacture, but none of them affect the final results in so great a degree as do the men employed by the superintendent to carry out his plans.

Each individual foreman will, of course, require individual methods of handling. Still, there are some general principles that apply equally well to all; and it is of these general principles that this paper will deal.

The average man who fills the position of retort house foreman knows nothing of chemistry or physics; yet it is to this man who has absolutely no knowledge of the fundamental principles and laws upon which the entire operation of gas manufacture is based that the Superintendent must mainly look for results; and it stands to reason that until he is taught just what he is doing and why, he cannot take the interest in his work that he should, and consequently cannot work as intelligently.

The question then resolves itself into two parts, first, the selection of the proper man, and, second, how to interest him in his work.

As for the selection of the proper man, remember that foremen, like poets, are born not made. If the man in question is a born forman, get him and keep him; if he is not, don't waste any time with him.

There are generally two retort house foremen, day foreman and night foreman. What can be done to make them take as much interest in the results they obtain as the Superintendent does? To begin with, let them know every day what they are doing; tell them what results they are obtaining, the yield per pound, the yield per retort, the total gas made, and the candle power. By so doing, they will naturally try to improve the results. If it should happen that their yield per pound has decreased, they will know it and try to discover the reason for it. If, on the other hand, by careful attention to their duty and hard work they improve their results, they should know it and be encouraged.

In order to obtain the maximum efficiency from the apparatus under his control, the retort house foreman must thoroughly understand its operation. He must be familiar with every detail, and he must know the "why" as well as the "how." How many superintendents have taken the trouble to explain to their foremen the principles involved in the operation of the modern recuperative bench? And yet the foreman is expected to keep the fuel consumed in the furnaces at a minimum and to keep the air slides so adjusted as to obtain the proper heats. Tell him how the bench is constructed and how to operate it to the best advantage, and, what is usually as important, "why" certain changes are made in the operation when the results being obtained are not as good as they should be. Do not let him remain in ignorance for months as to "why" certain changes are made and perhaps never find out.

But what is probably the greatest stimulus to the foreman to get good results is "rivalry." Not only let the day foreman know what he is doing, but let him know also what the night foreman is doing. Any day foreman who will let the night foreman make more gas than he does, and who does not do his best to beat him should be discharged. Similarly, any night foreman who lets the day man beat him on results and does not work over time until he finds out what the trouble is, should be gotten rid of. It might be stated right here, as a general principle, that any man who will allow another man under similar conditions to do more and better work than he does is not the man whom the superintendent wants as foreman, or, for that matter, in any capacity whatever.

There is one other way that helps wonderfully to make all the men, as well as the foreman, take more interest in their work. Give them a neat, well kept place to work in. Many gas works are about as dirty and uninviting places as can possibly be conceived of. All over the yard are scattered old boxes, pieces of pipe, junk and scrap iron of all descriptions, dirty paper and oily waste—pipe sheds and other buildings badly in need of repair and a general air of carelessness and dilapidation pervading the place. What kind of work can be expected of men with such an environment? Only careless and slovenly work. It won't show. There is so much more careless and slovenly work around it that their work will only be conspicuous if carefully and neatly done.

This fortunately is not the case with all works. The writer has had the good fortune to visit some works where there was not to be found a weed growing in the yard; the entire place was neat and clean, and everywhere were unmistakable signs of paint, whitewash and the broom; and it was only logical to find that the men employed in this establishment were neat and careful in their work, took more interest in it, and that in the long run the company profited by it in dollars and cents.

DEPRECIATION FROM A MANAGER'S POINT OF VIEW

The question of depreciation has been written and talked about so much, and I know so little about it as an abstract question, that I venture to tell your readers how it appears to me, operating a moderate sized company at a distance from the home office. Most of the articles that I have read have treated this matter in a broad way and from the point of view of one who is directing the accounts of many companies, large and small.

In my own case, I have found it necessary to differentiate very strongly between maintenance and what seems to me may properly be called depreciation. From the comparative reports which I receive, I find that the companies differ very widely in their charges for maintenance; and this is only natural, as different managers have very different conditions. I can well understand that a plant newly built within a few years will need a very small amount of maintenance for some time, and that a plant which is taken over in a run-down condition generally requires a good deal more. In this latter case, however, it is usual to allow a large sum for reconstruction, which is charged against the cost of the property, and in some cases, therefore, for some time the maintenance account is almost nothing. It is difficult, consequently, for me to learn from a study of the different companies' returns what I ought to charge for maintenance; so that I have been obliged to go ahead on the basis of doing what was necessary in the way of renewals and charging this in my maintenance account, leaving the question of depreciation to be taken up later; and it is on this particular point that I am a little in doubt.

We operate here a combined railway and lighting company; part of the construction is new, the railway being wholly so, as are also the extensions to the lighting plant made since it has been under the present management. To clear my mind on this question I have been accustomed to consider maintenance and

depreciation as two rather different things. For instance, it seems to me that if I have a lot of poles and wires in the air and replace yearly a sufficient number to keep these lines in good, strong, serviceable condition, there need be no charging off to depreciation on this account. So, on the railroad side, is it with ties and with overhead construction. In the matter of rails and cars, there seems to be a wide difference of opinion as to the length of time that a rail will last; and on this point I can only say that our rails have been in use five or six years, and show little or no sign of wear. The life of a car is also, I suppose, subject to climatic and other conditions, and it is difficult for me to tell whether or not I should lay aside each year enough to buy new cars when the present ones are scrapped.

Taking now the power end of the business, there is clearly no depreciation of real estate in the case of this company; nor much in the case of the buildings, these being constructed of brick, and such parts of the structure as are made of wood being repaired when needed and charged into expense. There remains to be considered the machinery; and although our engines, generators, pumps, condensers, etc., are kept in a constant state of efficiency by such parts being replaced as wear out, there will, of course, come a time, owing both to wear and the advance of the art, when these must be replaced at a large expense.

In all this question, I have endeavored to consider this company only, it naturally being the only one I am familiar with, and this is not written with a view to the broad question of how much should be charged off on an average by Stone & Webster companies for depreciation, as that is entirely beyond my scope.

So it seems to me that the charge for depreciation in this company should be limited to an amount to be charged off each year on the cost of the machinery, cars and possibly the rails, everything else being taken care of by the regular expense. I suppose that to do this there must be data at hand in regard to the life of machinery, of cars and of rails; and knowing the cost, we could then charge off each year enough to allow for the purchase of new stuff when the present equipment is worn out.

I have reason to believe that there is a further condition to be considered, viz., that of the treasury. If, for instance, at the end of any year, for any reason, it is found that we have earned our fixed charges and only about enough more to pay the interest on our preferred stock (which in this company has always been done with a good margin to spare), I suppose that the management would hardly think it wise to charge off to depreciation any substantial sum, leaving not enough to pay a dividend on the preferred stock.

I understand fully that the question in the case of this company, as of others, will perhaps be decided without consultation with me, but I have thought it might be interesting to show in what direction my thoughts on this subject have led me.

WHY SHOULD THE CENTRAL STATION DEVELOP ELECTRIC POWER BUSINESS ?

BY NORMAN T. WILCOX

Until recently it has been held by the average central station manager—and many managers think the same now—that an electric light plant cannot afford to solicit large electric power work, as the figures necessary to obtain it are too low to warrant a profitable return. But in many cases it is both profitable and wise for the central station to get busy and obtain some of this business. The resulting economy on the previously connected load, incidental to the additional long hours and consequent improvement of load factors warrants a much lower price than for lighting service, as the division of fixed charges over eight or ten hours per day, together with the greatly increased economy on the whole plant resulting from better average loads, makes much of this kind of load profitable even at apparently low figures. Generally the central station is obliged to operate twenty-four hours daily, so that, practically speaking, a few large power customers add but little to any of the operating expense accounts, except that for fuel; and when the power load commences to drop off at, say, 4.30 to 5.00 P. M., as is almost invariably the case in the average power installation, a large portion of the fixed charges can be apportioned over a period represented by the ordinary working day, plus such hours as the lighting load is on. This results in an excellent average station load and in the reduction of operating costs, which reduction applies to every K. H. W. output represented by the load connected prior to acceptance of this power business. broad policy of satisfactory service to, and treatment of, the public, from whom we obtain our franchises to do business, can be still further developed and broadened by pushing out for the large power business. The result will be a local interest in our enterprises, all classes in the community, the manufacturers especially, desiring our success. It is important that we have the active sympathy of this enterprising and influential class of citizens. If we are giving good service, and they realize that our charges are reasonable, we can expect to have the influence of these people and their friends at such times as there is municipal or similar agitation tending to impair the value of public service properties.

These are only a few of the reasons why we should take up power business. But it seems to the writer that they are potent ones, and that they should be carefully considered by every central station manager who is in a position to develop this service.

CONDENSER TROUBLES AND A REMEDY

BY A. H. WARREN

The Power Station of the Brockton & Plymouth Street Railway Company, which was completed early in 1900, was provided with two Blake vertical condensers piped to pump salt water. Owing to a galvanic action set up by the salt water between the metals in the condensers, the condenser bases caused much trouble and expense, until a remedy was recently tried which proved effective. A brief account of the troubles and remedy may be of interest.

In January, 1901, it was discovered that the iron studs in No. 1 condenser, which held the auxiliary cylinder in place, had been badly eaten. Angle irons were made and fitted to supplement the studs. In October, 1901, the old iron studs were drilled out and replaced by bronze studs.

In July, 1902, it was found that the valve deck of No. 2 condenser base was badly eaten and useless; so a new cast iron base was installed. This old base was repaired by boring out the valve deck and valve chamber and fitting a Tobin bronze lining, and the relined base was put under No. 1 condenser in January, 1903, and the base then removed from No. 1 was lined with Tobin bronze.

In March, 1903, this second relined base was put under No. 2 condenser, replacing the all cast iron base which had been installed in July, 1902.

By February, 1904, a hole had been eaten through this No. 2 base at the bottom, where it rests on the foundation. This hole was drilled and plugged. By December, 1904, the walls which separate the auxiliary suction chamber in this same base were destroyed, opening a clear passage through the auxiliary cylinder to the atmosphere. The auxiliary cylinders were taken out and the holes through the valve decks and main plungers covered with bronze plates, thus doing away with the auxiliary cylinders.

The frequent and expensive repairs had all been due to the

eating away of the iron of the bases. And as a remedy, it was decided to introduce metal plugs or pencils, in the hope that the galvanic action would be attracted to these pencils. The pencils were of zinc about 6 inches long, and were introduced in the suction chamber of No. 2 condenser. This was in December, 1904, and although this condenser has been in almost constant service since, and was at that time badly eaten away in places, it has given no further trouble, and the deterioration of the iron seems to have ceased absolutely. The pencils, on the other hand, are eaten away quite rapidly, requiring renewal, but at a trifling expense.

The old lined base under No. 1 condenser has recently been replaced by a new cast iron base provided with several zinc pencils. This base will probably give several years' service, with no expense except for pencil renewals.

TEXAS LEGISLATION AFFECTING STREET AND INTERURBAN RAILWAYS

BY EDWARD T. MOORE

The Thirtieth Legislature, at its regular session held this year, enacted legislation touching the regulation of street and interurban railways, which may be of interest.

The Jim Crow law heretofore existing in Texas applied only to steam railroads. This law was amended so as to include within its terms interurban and street railways. The law does not require the running of separate cars for the white and colored races, but does require that separate seats, equal in all points of comfort and convenience, shall be set apart for the two races, and that the seats shall be distinctly designated by a board, or marker, placed in a conspicuous place, bearing appropriate words in plain letters, indicating the race for which such seats are set apart.

Penalties are provided, which apply to the companies, to their employees operating the cars, and to passengers wilfully violating the law.

As to the street railways, most of the cities in the state already have in existence Jim Crow ordinances. While all of these ordinances differ in some respects, they are very similar in their essential provisions; hence, the enactment of this law will not change the status as to street railways; in fact, the state law will have the effect of making the rule with reference to seating the different races uniform in all cities in this state, and will also have a tendency to allay prejudice, which is often raised against street railway companies by the colored race on account of the enactment of such a measure by local city governments. Interurbans have had no Jim Crow law applied to them until the enactment of this legislation; but since the two races have pretty well become accustomed to such arrangements, it is not thought that this legislation will work any serious inconvenience or disadvantages to street and interurban railways.

In compliance with this new law, it is understood that all of Stone & Webster's Texas companies will use a small, neat sign made of mahogany one-half inch thick by four inches wide and eight inches long, on one side of which will appear the words "For Whites" and on the other "For Colored." On one end of the sign will be placed a hook, which is so arranged that it can be easily set into a brass socket so that the sign will extend longitudinally into the car. In this way the sign is plainly seen by passengers entering the car. In all semi-convertible and closed cars castings will be located, one on each post just under the lower molding of the advertising rack; in open cars castings will be placed on the molding immediately under the deck ventilation lights, in line with each post.

The practice will be to load white passengers beginning at the front and colored passengers beginning at the rear of the car, and it will be the duty of the conductor to shift these signs as the seating of the different races may require.

At the session of the legislature just closed there was enacted an anti-free pass law, which will become effective ninety days after adjournment of the legislature, i. e., July 12, 1907. This law applies to steam railroads, interurban railroads, street cars and other chartered common carriers or transportation companies or express or sleeping car companies. In so far as it affects street and interurban railways, it prohibits the free transportation of passengers, except the following classes of persons:

- 1. Company officers, employes and the dependent members of their families.
 - 2. Company physicians and attorneys.
 - 3. Sisters of Charity.
 - 4. Sheriffs or other elective officers.
 - 5. Members of the Live Stock Sanitary Commission.
- 6. Police officers and firemen of the city when authorized by ordinance.
 - 7. State health officers and one assistant.
 - 8. Federal health officers.
 - State rangers.
 - 10. Indigent poor under certain restrictions.

Half rates may be made to ministers of religion. The act provides heavy penalties, having application both to the company and to the person using or attempting to use the free privilege.

This law will practically put an end to free transportation in this State, and was enacted in response to a public sentiment aroused against the use by public officers of free privileges extended by public service corporations. No good reason is seen why this legislation should not be of material benefit to the public service corporations.

In addition to this state legislation, the city charter of the city of Dallas, enacted by the same legislature, prohibits the extending of such free privileges by all public service corporations in the city of Dallas, under penalty of forfeiture of charter, except to classes exempt from its provisions. The provision of the city charter referred to is given in full as follows:

Every public service corporation shall furnish and provide equal and uniform service alike to all citizens of the city of Dallas, and it shall be unlawful and a sufficient ground for the forfeiture of any franchise for any such corporation to grant free service, or furnish better service or to furnish service at a lower price or rate, quantity considered, to any person or persons, or otherwise discriminate in the matter of rates or service between citizens of Dallas. Upon proof being received by the Commissioners that this section is being violated, they shall at once summon witnesses and investigate, and if they so find then it shall be their duty to immediately cause suit to be instituted to have such franchise forfeited; provided, however, the Board of Commissioners shall have power by ordinance to grant any such corporation the right to grant reduced rates to persons specified in such ordinance, and provided, that the Board of Commissioners may, by ordinance, authorize any street railway or interurban railway to transport free any member of the police or fire department of said city within the corporate limits thereof, and to authorize the giving of such free transportation in other cases, when same shall not be in conflict with the general law of the state, which shall control and govern this subdivision."

News of the Home Office

Mr. Henry G. Bradlee becomes a partner from this date in the firm of Stone & Webster.

CHARLES A. STONE, EDWIN S. WEBSTER, RUSSELL ROBB,

Boston, Massachusetts, June 30, 1907.

Mr. Edwin S. Webster and family are at present in England, and expect to spend most of the summer in the North of France and Switzerland.

Mr. and Mrs. Charles F. Wallace sailed for Europe about June 1 for a vacation trip, and expect to return about July 15.

Mr. Charles D. Wyman has been on the Pacific Coast for some weeks looking into matters connected with the Puget Sound companies, and hopes to return about the 20th of July.

Mr. M. M. Phinney has been in the Boston office since June 17 on business connected with the Texas companies.

To meet the requirements of the Stone & Webster organization in Boston, a modern, eight-story, fire-proof building has been purchased. This building is centrally located in the business section of the city at 147 Milk Street, and on the corner of Milk and Batterymarch Streets, diagonally opposite the Exchange Club, and near the building of the American Telephone & Telegraph Company. Title to this building has been taken in the name of the Stone & Webster Engineering Corporation.

The library has already moved to offices on the third floor of this building, and the Engineering Corporation will move about August 1. The other departments will move as soon as arrangements can be provided. A photograph of this building and the floor plan will appear in the September number.

Eliot Wadsworth, head of the securities department, has just returned to Boston from a month's vacation abroad. He spent the greater part of his time in Paris and Holland. Prior to his trip abroad he visited Baton Rouge in the interests of the property there, of which Stone & Webster have recently become managers, and also made several trips to Chicago in connection with the opening of the new Chicago office.

John W. Hallowell, formerly head of the corporation department, who is second in charge of the securities department and assumes responsibility whenever Mr. Wadsworth is absent, spent a few weeks in Minneapolis recently in the interests of The Minneapolis General Electric Company; also a few days in Chicago in connection with the new branch office recently opened there. He has just returned to the Boston office after a few days' vacation, which he spent in assisting in the entertainment at the sexennial reunion of his class at Harvard, of which he is treasurer.

Charles Sprague, formerly with the Chase-Shawmut Company, is now a member of the securities department, his work confining him almost altogether to Boston. He recently moved his permanent home from Scituate to Brookline, and is this summer at the seashore at Ipswich.

Herbert H. Holton has recently returned from Chicago, where he was for about a month assisting Mr. Veitch in opening the Chicago office of the securities department. Aside from this, his work has confined him pretty closely to Boston. He is spending the summer on the North Shore.

Wilbur A. Carter has just returned from a week's vacation. He is busily engaged in building himself a house at North Scituate.

F. E. Frothingham, formerly manager of the Whatcom County Railway & Light Company, is now giving most of his time to the outside interests of the securities department. He has just returned from a visit to Detroit, Cleveland, Cincinnati and Columbus. During the past year, department work has taken him several times as far West as Denver.

Theodore T. Whitney, Jr., who was formerly with Blodget,

Merritt & Company, is always busy in the securities department with correspondence and attention to customers. His work confines him closely to the Boston office. It is he who sees that the routine work of the department is attended to.

Arthur J. Veitch, recently with Messrs. Peabody, Houghteling & Company, bankers, of Chicago, is now in charge of the Chicago office of the securities department. Before assuming his new duties he spent a few weeks in the Boston office.

W. F. Emerson recently became a member of the securities department. After being in the Boston office for some time he went to Chicago, where he is now assisting Mr. Veitch in the management of the Chicago office.

During the past month eight students have gone out from the statistical department of the Boston office. The following is the list of the men and the companies to which they have been assigned:

Charles S. Baldwin, Cornell '06, The Key West Elec. Co.

Leslie R. Coffin, Lawrence S. S. '06, Whatcom County Ry. & Lt. Co.

Reynold M. Harding, M. I. T. '05, Savannah Elec. Co.

Thomas P. Hubbard, Dartmouth '02, Dallas Elec. Lt. & Pr. Co.

James P. Jones, Wm. Penn Charter School, Tampa Elec. Co.

Harold K. Monroe, M. I. T. '06, Baton Rouge Elec. & Gas Co.

Robert C. Newcomb, Cornell '06, Pensacola Elec. Co.

Percy A. Staples, M. I. T. '06, Houghton County Elec. Lt. Co.

Between the last issue of this magazine and the present time, eleven new men have been added to the students in the home office, as follows:

Hans O. C. Isenberg, M. I. T. '06.

Thomas L. Dunn, Cornell '06.

Maurice H. Pease, M. I. T. '07.

Thomas J. Hanlon, Jr., Lawrence S. S. '07.

Edward M. Farnsworth, Jr., Lawrence S. S. '07.

Walter C. Kennedy, Cornell '07.

Alexander Macomber, M. I. T. '07.

Thomas C. Keeling, M. I. T. '07.

Richard H. Harris, Lawrence S. S. '07.

Walter H. Balcke, Cornell '07.

Alvin W. King, Cornell '07.

The Library has moved to 147 Milk street (cor. Battery-march) where it occupies six rooms on the third floor of the building that Stone & Webster have recently purchased. Entrance at room 309.

"The Library and the Business Man" is the title of a 50-page pamphlet by G. W. Lee, being the revision and completion of a paper presented at the 29th annual meeting of the American Library Association at Asheville, N. C., in May. Its main divisions are: 1, Scope of the business; 2, Demands upon the Library; 3, Sources of information; 4, Working methods; 5, Improvements and limitations; 6, Some unsolved problems; 7, Information bureaus; 8, Esperanto; 9, Miscellany.

"Current Literature References," January-June, 1907, modeled after and superseding the set that was issued for January alone, are to be ready for distribution about August 1. Apply to Library Department for either of these publications.

The Library aims to be useful to all connected with the Stone & Webster organization, whether in Boston or elsewhere, and it is proposed to list in each number of this journal magazine articles of particular interest, book accessions and other items concerning the department.

News from the Stone & Webster Engineering Corporation

BOSTON.

The Stone & Webster Engineering Corporation is progressing rapidly with the work on the Boston Elevated Railway Company's power stations at Charlestown, Lincoln Wharf and Cambridge.

The Charlestown Power Station is an extension of the present station with room for two 2700 Kw. vertical engine driven units, and eight 600 h. p. boilers. Only half of this equipment is being put in at present, however.

The building walls are up and the roof is on, and the chimney, 12 ft. in diameter by 200 ft. high, is practically completed. Four Babcock & Wilcox boilers have been erected and are nearly ready for brickwork and piping connections. The erection of the piping is already under way.

All machinery foundations are in place, and the main driving shaft of the engine and the armature spider for the generator have arrived and will be placed within a few days.

Work upon the engine, which is being built by McIntosh, Seymour & Company of Auburn, New York, is being pushed forward as fast as possible, and it is expected that the base plates will be shipped by July 10, and the balance of the engine by about the first of August.

It is planned to have this station in complete operation about Nov. 1.

The extension to the Lincoln Station will contain 5400 Kw. in apparatus made up of two units of 2700 Kw. each.

The engines are of the vertical Corliss type, made by The William Tod Company of Youngstown, Ohio. The base plates and shaft for the first engine have arrived and are now being erected.

The spider for the first generator is also on the ground, and the work of building up the armature will proceed as soon as the shaft is placed in its bearings. The balance of the first engine will be shipped early in the present month. It is expected that the second engine will come forward in August.

There will be eight 600 h. p. Babcock & Wilcox boilers in this new portion of the station. The work of erecting them is well advanced, and they will be ready for brickwork about the middle of July.

The chimney 13 feet in diameter by 250 feet high is completed, and awaits the flue connections.

Work on the building walls and roof will be completed about July 20.

Owing to delays in securing permits to build from the Cambridge city authorities, work on the Harvard Square power station was not started until seven weeks after the other two jobs, and the station is, therefore, not as far advanced. At the present time the foundations are in, the structural steel erected, and the masons are at work on the brick superstructure, which will be pushed forward as rapidly as possible, and the building got ready for machinery about August 15.

It is now only about five months since the first contract for these power stations was signed, and their condition shows that the work has been energetically pushed from the start. The engineers' schedule required extremely rapid construction work, but it appears that, so far, the various portions of the work have been completed in advance of the schedule, and the indications are that unless some unforeseen delay occurs in the delivery of machinery the stations will be completed somewhat earlier than originally specified.

In addition to the above work, the Stone & Webster Engineering Corporation have in hand a wharf and a 5000 ton elevated coal pocket with tracks, conveyors, etc., for the Boston Elevated Railway Company. Plans are nearly completed for this work, and construction will be started as soon as the material can be obtained.

FRED N. BUSHNELL.

JACKSONVILLE.

Mr. A. J. Farnsworth left for Jacksonville on June 29 to take charge of additions and changes in the power station, contract for which has been given us by the Jacksonville Electric Co. The



new work will cover the installation of an 800 Kw. railway unit, self-supporting steel stack, 520 h. p. Babcock & Wilcox boiler and four additional feeder panels. Practically no changes will be made in the building, except the removal of some old foundations which are in the way of the new units. Owing to the impossibility of getting an early delivery on the generator, the work will probably last until the end of the year.

HOUGHTON.

Mr. A. C. Ralph has recently left for Houghton to act as Superintendent for the Engineering Corporation on some changes and additions to the equipment in the lighting station. The work contemplated covers the installation of a 1000 Kw. Curtis turbine, with the necessary auxiliaries. It is also proposed to increase the height of the short stack, which is now operated by forced draft, with the idea of abating the smoke nuisance. If the machinery is delivered on time, it is expected that the work will be finished by the middle of October.

TERRE HAUTE.

The work which the corporation has been doing on the Water Street Station is practically completed. The new Brazil and Seelyville sub-stations on the Brazil line are completed and ready for operation. The work on the Paris extension is progressing favorably, and from latest reports we expect that the sub-grade will be completed in Indiana by the first week in July, and in Illinois by the middle of the month. A steam shovel purchased last winter has been used on heavy cuts with very advantageous results.

SEATTLE.

The reinforced concrete power house which we have been building at Georgetown for The Seattle Electric Company is completed; but as is frequently the case, additional equipment was ordered before the completion of the building, and we are now preparing foundations for an 8000 Kw. turbine. A Weber reinforced concrete stack has also been contracted for. The car barns at North Seattle and the Georgetown shops, which we have also been building for The Seattle Electric Company, are now practically completed, nothing remaining to be done except finishing the plumbing and heating. In addition to these three pieces of work our Superintendent on the ground, Mr. Whitson, has been getting

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out plans for two reinforced concrete sub-stations, for which we have received contracts from The Seattle Electric Company. Foundations for these buildings are now in, and it is expected that they will be completed by the first of November.

TAUNTON.

The Engineering Corporation has recently signed a contract with the Cell Drier Machine Company covering the construction of a foundry, machine shop and cleaning house at Taunton. The foundry and machine shop are brick buildings with ferro-inclave and concrete roofs. This form of roof was used in order that the buildings might be under cover as soon as possible, as the Cell Drier Machine Co. was very anxious to begin operations. Work was started the last week in April, and it has been expected that the buildings would be under cover and ready for the Cell Drier Machine Co. to install their equipment by the middle of July, but owing to delays on the part of the steel contractor this date will probably be exceeded by about ten days.

H. L. ROGERS.

National Electric Light Association Notes

At the annual convention of the National Electric Light Association held at Washington, D. C., June 4-7, the delegation from the companies managed by Stone & Webster was only exceeded in number by two other organizations, these being The New York Edison Company and the Public Service Corporation of New Jersey. The following men were in attendance, and five or six of them were accompanied by their wives:

- J. S. Bleecker, Paducah, Ky.
- W. H. Blood, Jr., Boston, Mass.
- F. E. Fletcher, Tampa, Fla.
- H. J. Gille, Minneapolis, Minn.
- J. A. Hunnewell, Lowell, Mass.
- H. H. Hunt, Savannah, Ga.
- G. K. Hutchins, Columbus, Ga.
- J. W. Leadley, Pensacola, Fla.
- A. W. Leonard, Minneapolis, Minn.
- F. W. Loomis, Savannah, Ga.
- A. F. Manning, Seattle, Wash.
- A. S. Michener, Boston, Mass.
- L. R. Nash, Savannah, Ga.
- W. B. Purse, Savannah, Ga.
- C. E. Roberts, Pensacola, Fla.
- D. P. Robinson, Boston, Mass. (Engineering Corp.).
- W. B. Stoughton, Boston, Mass.
- W. R. Sweany, Savannah, Ga.
- S. B. Tuell, Terre Haute, Ind.
- Wayne Warfield, Tampa, Fla.

It was found that only a few of the men knew all of the others. It was therefore arranged to bring them all together at an informal luncheon at the New Willard. A pleasant two hours was spent in becoming acquainted, in comparing notes as to opera-

tions in different cities, and in disposing of the very acceptable luncheon.

President Williams of the National Electric Light Association appointed a committee on the grounding of secondary A. C. circuits, of which Mr. W. H. Blood, Jr., of our Boston office is chairman. At the meeting in Washington, the committee recommended the passage of a "rule which should make it mandatory to ground all secondary A. C. circuits where the difference of potential between any point and the ground does not exceed 150 volts; that wherever possible this ground connection should be made by a solid wire connecting with the water pipe, and where such construction could not be obtained that a ground of sufficient carrying capacity should be made so that in the event of trouble the fuse in the primary circuit would be blown." The committee further stated that "as to the grounding of circuits in excess of 150 volts and of polyphase circuits, at the present time they had no recommendations to make, but that they were studying the matter and hoped to have definite recommendations to present some time previous to the Underwriters' Meeting next March."

The above matter is one of great importance in the protection of the lives of electric light users. Any suggestions on the subject will be gladly received by the chairman of the committee.

News From The Companies

BROCKTON, MASS.

Brockton still leads the country as the shoe centre, according to the figures of the special census bulletin just issued by the United States bureau at Washington. It shows that Brockton has a lead of \$4,121,000 in value of output over its nearest competitor, Lynn, during a period of five years from 1900 to 1905; and the neighboring town of Rockland has jumped from 36th place to 20th place in the list of shoe centers. The past six months has been a record breaker in point of shoe shipments, 421,623 cases having been shipped from Brockton.

Picture in your mind a line of men in the act of unloading a wagon load of watermelons, and you have a good illustration of the method used in excavating for the Brockton Edison company's new power station. At a depth of about three feet a bed of the finest brick clay in this district was found, which extends to a depth of at least eighteen feet. Picks and shovels are of little use in handling this material, and the engineers in charge were confronted with a new problem; they finally hit upon the scheme of using grub hoes, which loosen the clay in large lumps, the lumps being picked up by hand by a second gang and passed along the line until they finally reach the cart ready to be hauled away.

Arc lamps have been installed, so that the work of excavating, which is now being carried on by night as well as by day, is rapidly nearing completion. One pile driver has been erected and a second one is expected in a short time. The railroad trestle is expected to be ready for use in a few days.

About nineteen hundred feet of conduit has been laid on the new underground system, which was started recently. A transmission line between Stoughton and Brockton is in course of erection, which, when completed, will enable the Stoughton Gas & Elec-

tric Company to purchase electrical energy from the Brockton company.

The master electricians and the members of the Electrical Worker's Union are at odds over the new working agreement which the union has submitted for the master electricians' signatures. The union's demand includes a forty cent per hour rate, \$2 per day for helpers the first year and \$2.50 the second year, and car fares to and from jobs. The bosses say they have offered to meet the forty cent rate, but cannot see their way clear to pay so much money for helpers, especially as not more than one helper is allowed to a shop, or more than one helper with each journeyman on a job outside of a shop.

With all the things asked for by the union granted, the masters say they could not hope to compete successfully against out-of-town contractors for out-of-town work. The unionists contend that a stringent law on helpers is essential for the protection of the journeymen.

Mr. Alton W. Leonard, manager of the Minneapolis General Electric Company, and Mr. P. S. Sweetser of the Paducah Light & Power Company were recent visitors at the plant.

CANTON, MASS.

Lying due south of Boston, about 10 miles distant, and readily accessible to the public by the cars of The Blue Hill Street Railway, is the Blue Hill Range, the most conspicuous feature of the large Reservation, owned by the Commonwealth and maintained for the enjoyment of its people.

A broad path leads from the cars to the summit of Great Blue Hill and enables visitors to obtain a magnificent view at an elevation 635 feet from mean sea level.

Over 8,000 people have been known to visit the summit on a pleasant Sunday, while as many more roamed the woods and found recreation in various ways.

The Metropolitan Park Commission are soon to make it possible to obtain water for drinking purposes at the summit, a supply tank having been erected and a pipe laid to a fine spring in Coon Hollow Path, where a gasoline engine is to be installed to pump the water from the spring to the reservoir. This will be appreciated by the many thousands who visit the summit.

The Metropolitan Park Commission, from money appropriated by the State, are erecting a band stand in a beautiful grove a short distance from the entrance, near the path leading to the summit, and are to give a series of concerts, commencing Saturday, July 20, from 4 to 6 P. M., and continuing each Saturday until and including September 14. These concerts are to be given by G. A. R. Post Band of Dorchester (25 pieces) and no doubt will be enjoyed by a large number of people, not only from adjoining towns but from the Boston district, and will materially increase our receipts.

A. H. Walcott.

PLYMOUTH, MASS.

Plymouth, historically considered, is the most interesting town in America, and is yearly visited by thousands of tourists. Its location, 40 miles from Boston and connected with that city by excellent roads, coupled with its historic interest, makes it especially favored by users of automobiles. As a result the Hotel Pilgrim was frequently unable last season adequately to accommodate all the parties that came to it as guests.

To provide ample and satisfactory accommodations for the present season, extensive additions have been made. These consist of a store-room, a new bakery, and a refrigerating room, in the back of the house, and a large and attractive cafe and billiard room. But all these are of minor importance when compared to the enlargement of the main dining room. This room has been extended on the water side in a huge bay with large plate glass windows, giving an unobstructed marine view to the north, east and south that it would be hard to equal. The finish and furnishing of the room is simple but attractive, very light and airy, and the seating capacity double that of last season.

The grounds about the house have also been improved by planting shrubs and trees. This work is part of a comprehensive scheme, which will, in the course of a few years, add very much to the appearance of the property. The golf course, which was laid out by the expert, Alex S. Finley, is now in its second year, and shows the best results from the attention given it. The course is difficult, with severe penalties for poor direction, very picturesque and with excellent fair-greens. It is believed that this season will exceed the best the hotel has ever had in the past.

The regular theatrical season began at Mayflower Grove on Monday, June 17, and during the first two weeks our patronage has shown satisfactory gains over last season.

The principal new feature is a substantial wooden cover over

600 seats at the front of the theatre. A good floor has been laid with an adequate pitch, so that all of the seats command a good view of the stage; 112 of the best seats have been numbered, and tickets for these may be bought in advance for evening performances at 25 cents each. The remainder of the covered seats are sold for 15 cents. Admission, including a seat in the back of the theatre enclosure, is 10 cents.

The theatrical attractions furnished us are exceptionally good for summer park business; in fact, we have the same shows that play Norumbega and Lexington Parks. There will be seven weeks of vaudeville, one week of opera, and four weeks of musical comedy. The latter are written especially for park business, designed to run an hour and a half, and are complete in every detail, well costumed and well cast.

The theatre cover now makes it possible to give a performance without regard to weather, and while large audiences are not expected on stormy nights, threatening skies will not spoil our business as in the past. The cover is also responsible for a decided increase in the proportion of 15-cent seats sold; and on good nights the 25-cent seats are practically all sold. Altogether, the results already apparent from investment in the cover are highly satisfactory and exceed expectations.

HOUGHTON COUNTY, MICHIGAN.

Several changes for improving the arrangement of the switchboard and distributing wiring and the equipment pertaining thereto are being inaugurated in the Houghton station. Oil break switches have already been installed on a part of the commercial lighting circuits, and the work of providing facilities for additional circuits and of newly equipping the system with lightning protective apparatus is well underway.

In the old arrangement the lighting circuits were connected directly to one set of the main bus-bars through air break switches and were protected by fuses and circuit breakers. The loads on the circuits were becoming too heavy for this method of control for a 2300 volt system, and it was decided to replace the old switches by General Electric Form K-3 hand operated oil break switches.

In the new arrangement, which is now partially in operation, the lighting lines are fed from an auxiliary set of two-phase buses, which may be thrown onto either set of main bus-bars through a four pole double throw oil switch. This switch is provided with an automatic overload release operated by a definite time limit relay. The circuit switches are of the automatic double pole, single throw type, the trip coils being actuated by bellows type, inverse time limit relays. When the work of installing these switches is completed, all of the 2300 volt circuits in the station will be supplied with oil switch control. The new oil switches are mounted on a frame work at the rear of the switch board, and are operated through a lever control mechanism. This allows free access to the rear of the panel and eliminates all high voltage wiring on the panels.

Provisions have been made for running additional circuits by building a wire rack into the wall at the went end of the switch-board gallery. This rack allows for two new high tension lines and for seven 2300 volt single phase circuits. At present only 2300 volt lines will be run out at this end of the station, as the new outlet is primarily intended for the new power circuit to the Atlantic Mine, although several of the circuits now making exit at the east end of the gallery will be run out the west end in order to relieve the crowded condition of outgoing lines, lightning arresters and choke coils at the east end, a condition which, with the increasing load on the station, is rapidly becoming unsafe from an operating standpoint.

A number of the 2300 lighting lines run out of Houghton forseveral miles to supply the small towns, which are growing up around the mines and the smelters in the adjacent territory. Somedifficulty has been experienced in maintaining constant voltage at the end of these lines, with changes in load, even by closely following the load with adjustments of the circuit potential regulator. With the hope of eliminating this trouble, G. E. Type V Lines dropcompensators are being placed on these circuits.

The new circuits, which are to be run out of the west end of the station, are all provided with the new type of G. E. shunted resistance multigap lightning arresters and choke coils, and the circuits leaving the east end of the gallery will be protected in a similar manner, as fast as the re-arrangement of lines is carried out. The circuits, at present are equipped with the series resistance type of arrester, which have arced badly during lightning storms, and have not always prevented lightning from entering the station, although no damage has ever resulted.

The G. E. 12,000 volt multi-gap arresters have just been in-

stalled on the transmission lines at the cable-house on the north side of Portage Lake. These arresters should prove a protection for the submarine cables, and also for the station. It is intended to keep a record of all lightning and other discharges over all arresters by means of tell-tale papers, that some opinion may be formed as to service they actually perform.

Plans for outside construction for 1907 are as follows:

The Electric Light Co. has laid out some very definite plans covering new outside construction of a part of its distributing system. The work is to be done during the open season. (By open season we mean the five months, May to Sept., inclusive. The balance of the year in this country is unsuited to outside construction work.) We have only just fairly begun, however, owing to the extreme lateness of the present season.

This reaching out feature of our system is the natural result of the development of this county, which is primarily and always a mining country. Mines are opened here and there on the mineralized belt and mining settlements are established, which soon grow into thriving and prosperous townships. It is at this time that the lighting company steps in with its service for power and light to further advance the growth of the community.

It is readily seen that when the community is small and the distance perhaps some miles from our power or sub-station, the lighting company can only afford to build such a line and install such apparatus as meet the early requirements. It is also readily seen that the village will sooner or later outgrow the capacity of the early system and that then a more adequate system must be provided.

This is the situation at the present time with the towns of South Range and Mohawk. Each of the towns is rapidly growing and our present service must be improved. The village of Atlantic is southwest of Houghton, a distance of about 4 miles. Four miles beyond Atlantic, and on the same line, lies South Range. The former town is the older, and until within a year of two has had the greater population. Our first line was therefore run to Atlantic. This was later extended to South Range. It consisted of 2 No. 6 copper wires carrying 60 cycle single phase current at 2300 volts. The load is now so great, however, as to make it practically impossible to operate this line and obtain a satisfactory secondary voltage at both Atlantic and South Range. It was therefore planned early this year to rebuild this line, and we are now arrang-

ing to furnish two phase current over 4 No. 4 copper wires as far as Atlantic, and single phase current over 2 No. 6 copper wires from Atlantic to South Range. We will carry Atlantic lighting on one phase and South Range lighting on the other, thus reducing the voltage drop on the South Range phase. The running of two phases also makes our service available for two phase motors, and we start on the new system with about 50 H. P. of motors at the Atlantic Mine. The situation as regards the Mohawk line is almost identical with that just cited for the South Range, and in this case, by running two phases to a point about 4 miles distant from our Sub-Station, we pick up about 50 H. P. in motors at the Wolverine Mine.

Besides the above work on our distributing system, we have planned to erect pole lines in practically every alley in the village of Laurium. These alleys run lengthwise of the village and midway between the streets. By occupying these alleys we no longer require our poles on some of the streets, and streets without poles greatly add to the appearance of the town. We have always found it preferable to feed from the alleys rather than the streets, where it is possible to do so. These three pieces of work, together with the usual reconstructions and extensions, will give employment to about fifteen men during the greater part of this summer.

On Jan. 1, 1907, The Houghton County Electric Light Company made a reduction in its power rates for day service, with the object in view of securing many small customers and several larger ones, which they thought could be had by a more liberal plan than had been previously offered.

The new power rates call for a minimum charge of 50c. per H. P. per month of connected load. Current is metered and based on 7c. per K. W. H., subject to reduction as follows:

Up to 200 K. W. H. per month, 7 cent rate. From 200 K. W. H. to 300 K. W. H. per month, 6.5 cent rate. From 300 K. W. H. to 400 K. W. H. per month, 6 cent rate. From 400 K. W. H. to 500 K. W. H. per month, 5.5 cent rate. From 500 K. W. H. to 750 K. W. H. per month, 5.1 cent rate. From 750 K. W. H. to 1000 K. W. H. per month, 4.8 cent rate; and so on step by step until consumption reaches 100,000 K. W. H. per month, and over which the rate is 1.85 cents.

These rates permit a customer to use power at any time during the day, except between the hours of 5 P. M. and 11 P. M. during the months of November, December, January and February, and 7 P. M. and 11 P. M. during the remainder of the year. Customers who wish to use power 24 hours a day are charged \$1.50 per H. P. per month in addition to charge made for current consumed. For one year contract these rates are net, and every additional year a cash discount of 2 per cent. per year will be allowed. Therefore a customer signing a five year contract will be entitled to an 8 per cent. cash discount.

It will be seen that this new schedule of rates is uniform and applicable to any customer from 1-2 H. P. to 200 H. P. capacity, or over, and equally applicable to any day service, such as flat irons in a laundry or any other heating device used in large numbers or in continuous service during the day. From experience to date, we consider that the new schedule of rate is fulfilling its purpose.

\$6000 of treasury bonds of the Houghton County Electric Light Company recently offered for sale have been sold in behalf of the company through the securities department in the Boston office.

MINNEAPOLIS, MINN.

The desirability of a heating load for central stations is too apparent to need comment. The subject of vital interest, however, is how to go about it to develop this business to make it a profitable source of income and assure consumers that the results will be satisfactory. Mistakes may be made at the start that will do much to prejudice consumers against the use of electricity for heating, rather than in its favor. Many of these mistakes may be traced to the lack of reliable information as to the behavior of the different heating devices on the market, particularly on the part of central station men. There is a good deal of business that the central station had better let alone until the question of what device is best suited to the work is learned and what rate for the service can be offered.

A large proportion of the consumers seem to have the impression that because it is electricity that is doing the work the results are instantaneous and always satisfactory. They do not understand how the question of quantity and application of the electric current affect the work to be done. They expect immediate results, and are therefore disappointed when a disc stove takes

half an hour to boil a quart of water, or a flat iron selected at random fails to stay hot on damp linens, and are likely to condemn the whole business because the salesman has sold them something that experience would tell was not adapted to the customer's requirements.

It is quite a general custom to maintain a display room for the purpose of interesting the public in what can be done with electricity. The Minneapolis General Electric Company rented a small store several doors from the general offices, and proceeded to stock up with nearly everything on the market in the shape of electric heating devices. A good deal of space was given for lighting and small motors, but as the motor business was handled by the supply houses which did little electric heating, the work of developing a heating load was regarded as paramount.

The experimental work of this department has involved considerable expense and resulted in many devices being purchased that have not proved satisfactory from any standpoint. It has occurred to us in this connection that a good deal of money might be saved if Stone & Webster should maintain a laboratory for the purpose of conducting such tests and examination of all devices appealing for popular favor, and advise the different companies as to the results—a sort of central station clearing house, as it were.

Much time has been wasted in pushing electric flat irons, due to absence of definite information as to the best makes and sizes, which such a central information bureau would prevent entirely. It is admitted that the flat iron business represents the most desirable heating load. It is therefore essential, where the customer pays more for this service than for other methods of heating, that the extra expense be offset by some decided advantages. This is true both of tailors and housekeepers. The latter look to the pleasure given as the compensating advantage. To make a flat iron generally popular it must be a pleasure at all times to use it, and there must be an elimination of every annoying feature as far as possible. There are some flat irons now being aggressively advertised that, owing to their want of the features necessary to give this degree of pleasure, are a positive detriment to the business.

The experience of this company leads to the conclusion that a flat iron should be so constructed as to throw a large proportion of its heat into the point. This is of more importance in practice than would appear at first, as it is a fact that as the point is the part that first encounters the cool damp cloth it therefore requires more heat, and if the point is cool, allowing starch to stick to the iron, no amount of heat at the heel will allow it to work smoothly.

The second feature of importance is the necessity for a simple, quick and strong attachment of cord to iron, so that the heat may be controlled by putting this plug on and off. It should be possible to separate the cord from the iron without binding or visible arcing. This allows freedom of movement, does not confine the operator to the length of the cord, and makes it possible to control the temperature regardless of the location of the switch. For it is a frequent source of trouble that wiremen often locate the controlling switch on the opposite side of the room from where the iron is to be used.

In the matter of building up a flat iron load the plan of introduction demands careful attention; whether to sell at a profit, at cost, or to lend them to consumers. The Minneapolis General Electric Company, after a year of selling at cost which involved a great expense, has decided to lend flat irons to consumers on a payment of a deposit of three dollars, which is refunded on the return of the flat iron in good condition.

The plan of thirty days free trial in use last year necessitated a great deal of labor and time, and often lost excellent business in flats and rented houses where the tenant was not sure that he could use it at the next location. This business can now be secured, and the customer gets the benefit of the saving effected by the new plan. An iron is placed in a much shorter time and the customer is better pleased, and best of all the electric company gets good business at a small cost. It may be expedient to discontinue this loaning agreement after the flat iron business has developed a firm foothold, but in the development of the business it appears to be the quickest and most economical plan to rapidly place a large number in service.

While walking about the average town, one is greatly surprised and disappointed to see the extremely small proportion of the better class of residences which are now lighted by electricity.

While there are several very good reasons for this condition, it seems to resolve into one real factor, which is this: the company's failure heretofore to push the matter of wiring new buildings.

By a systematic course of following up the building permits issued, there is no reason why a large number of the people who are putting up high and over medium priced residences could not be convinced of the advisability of having them wired, even if they had no immediate intention of using electric lights.

The majority of house holders are looking forward to more prosperous conditions, and we all hope they will soon appreciate the great superiority of electricity as a luminant.

Even if the builder does not hope to be able to use electricity himself, he should provide the interior wiring, on account of its increasing the selling value of his property if for no other reason.

If the house is wired, it is a comparatively easy matter to convince the owner of the great advantages of electricity, and we of the inner circle only ask a trial, for like the patent medicines, "Once tried, always used."

Let us then devote more of our time to the new buildings and pave the way for a future business, even if we do get no direct benefit in the immediate present. It is the key to a great increase in residential lighting business, and the people should be so educated as to consider it just as important to have the house wired for electric lights as to have it piped for water or gas.

Mr. Gardner Rogers, formerly manager at Ponce, Porto Rico, has been appointed superintendent of The Minneapolis General Electric Company, to fill the vacancy caused by the promotion of Mr. Marcy L. Sperry to the position of manager at Savannah, Georgia.

Mr. H. J. Gille, for several years superintendent of the St. Paul Gaslight Company, has been appointed contract agent of The Minneapolis General Electric Company, to fill the vacancy caused by the transfer to Savannah, Georgia, of Mr. W. R. Sweany, who is taking up similar work for the Savannah Electric Company.

PADUCAH, KENTUCKY.

Mr. Tripp was in Paducah the first of June on his way to Boston from Baton Rouge.

Mr. Bleecker was away the first ten days of June attending the National Electric Light Convention in Washington; he also spent a few hours in Jamestown.

Mr. P. S. Sweetser is away on his vacation, having left June 14 for Boston, by way of Jamestown.

The Chautauqua which is being held at Wallace Park this month is well attended, the weather being ideal for an outdoor meeting.

COLUMBUS, GEORGIA.

Columbus, Georgia, the county seat of Muscogee county, is situated at the head of navigation on the Chattahoochee River and at the foot of its falls, 360 miles from the Gulf of Mexico, 125 miles southwest of Atlanta, 300 miles, directly across the state, from Savannah, and 158 miles from Birmingham, Alabama, the center of the coal, iron and steel industries of that state.

The population, according to the city directory census of 1906, is 38,415.

The city is laid out with broad and beautiful streets, usually with double rows of shade trees on either side, or with parkways in the center.

The city has a sewerage system, water works, an excellent fire department, telephones, electric lights, gas, and about 25 miles of street railway. Rapid strides have been made in constructing modern pavements, which add greatly to the appearance and comfort of the city.

The climate is delightfully mild and healthy, no severe extremes of either heat or cold being experienced.

The most important recent occurrence in the history of Columbus has been the acquirement of several water power companies by the Stone & Webster interests of Boston. These properties extend for miles up the Chattahoochee River; they embrace all the most important water powers between Columbus and West Point, and are estimated to be capable of developing about 100,000 H. P. These properties include the completed development at Lover's Leap, just above the city limits, with a capacity of upwards of 10,000 H. P., a large part of which is being utilized to drive the mills and manufactories of the city.

The new management set about preliminary work looking to the building of other dams up the river, and at once began operations on the building of a large reinforced concrete steam station, with a present capacity of 3000 H. P., and capable of indefinite extension, for the purpose of taking care of its customers during periods of low water and providing for such additional business as may be secured before the completion of the next dam. This

splendid station is now complete and furnishes a strong assurance of uninterrupted service to all the present and prospective customers of the company.

Some idea of the immensity of this water power may be realized from the statement that it is more than sufficient to drive all of the one hundred and eleven cotton mills in the state of Georgia, with their equipment of 1,192,486 spindles and 26,645 looms.

In the midst of the cotton belt, Columbus enjoys a large trade in the staple, \$12,000,000 being the value of the cotton concentrated at this point last year.

The United States government is now engaged in improving the navigation of the river below Columbus, whence three lines of steamers ply to the Gulf. Seven lines of railway controlled by three trunk line companies already offer excellent transportation facilities, while two additional lines are under construction.

With this great water power as an asset and with the favorable location in which Columbus finds itself, a combination of economic conditions exists for manufacturing industries that is sure to make Columbus one of the most important industrial centers of the South.

The daily press of the country and at least one of the prominent magazines have recently had a great deal to say regarding child labor in the South. They have drawn some very unfavorable comparisons and grossly exaggerated true conditions, at least so far as Columbus is concerned, where everything possible is being done towards the comfort and education of the young.

As an illustration, one of the large cotton mills here maintains, at its own expense, a free kindergarten, in which the children of those employed receive elementary instructions.

In addition to this, and as a part of the public school system, primary and secondary industrial schools have been established, Columbus being a pioneer in the South in this respect. The primary school has a kindergarten attached. It takes care of the very small children of the mill employees and instructs the larger ones in various useful occupations, such as the elements of carpentry, basket weaving, gardening, etc. The secondary industrial school is a magnificent building, erected at a cost of \$100,000, a large part of which sum was contributed by public-spirited men, and the equipment for which was donated by the manufacturers of machinery all over the country.

In this school are taught the wood and iron-working trades, textile manufacturing, domestic science, millinery and other useful practical arts, for the purpose of fitting the students for responsible positions in after life. The city has also an excellent system of public schools.

Among the more important buildings are the county court house and city hall, the United States post office (which is of the "first class") and court house, a fine union depot, masonic temple, numbers of beautiful churches, and a splendid marble Y. M. C. A. building, erected largely through the munificence of Mr. George Foster Peabody. A public library building contributed by Mr. Andrew Carnegie is now under construction.

Columbus was formerly the home of such notable men as George Foster Peabody, Oscar Strauss, now Secretary of Commerce and Labor in President Roosevelt's cabinet, and the late Samuel Spencer, president of the Southern Railway. It is also noted as being the home of Blind Tom, the celebrated negro musician, whose wonderful talent charmed the music loving world. The last battle of the Civil War east of the Mississippi was fought upon the surrounding hills and in the streets of Columbus, entailing the needless sacrifice of a number of human lives and the destruction of millions of dollars worth of property, for the war had already ended. The commanding officer of the Federal forces, however, claiming not to have heard of Lee's surrender, proceeded to apply the torch to thousands of bales of valuable cotton, then worth one dollar a pound; the Eagle Mills, where much of the cloth for army uniforms was made, the large flour mills, which had been kept busy turning out food for the army, and the Columbus Iron Works. where many a gun and sword had been manufactured, were all burned. These industries have risen from their ashes and, together with many new ones, are busy in the arts of peace.

JACKSONVILLE, FLA.

Edwin P. Douglass, who for the past fourteen years has been employed as conductor by the Jacksonville Electric Company, was, on May 28, elected city marshall in that city. Mr. Douglass was elected to this position on account of the reputation he had made while upon the cars. His courteous treatment of passengers, particularly women and children, won him the esteem of the entire community, and they took this very unusual method of rewarding him.

BATON ROUGE, LA.

Extract from a personal letter to Boston:

I know I've been here almost a month, but I actually havn't had time to write before. Baton Rouge is all O. K., one of the prettiest cities in the South, I think; and then being the capital of the state and having the Louisiana University here, makes things more interesting from a social standpoint. I know from my own experience that those "fussers"—N., S. and G.—would be more than satisfied here.

The Engineering Corporation are getting well under way now. Mr. Brown, from Paducah, is superintendent of construction, and the accountant is Page, from Everett. Page used to be in the accounting department last fall, and then he went to Tampa. Page and I have just got back from a drive with the engineering corporation's rubber-tired buggy.

I have been doing about everything imaginable, from testing and repairing meters down to bossing a gang of niggers on construction work. Am at present getting up a daily station report, which I suppose will have to pass through the "Form Department." One dirty job I had was getting the capacity of a centrifugal pump run by a motor at the city's sewerage pumping station. We got one of the purifier tanks down from the new gas plant to measure the output; when the tank was full one of the niggers had to get underneath and open up the outlet.

About a week ago I had to test and adjust the railway recording water meter at the station. One of the linemen was assigned to help me, and we rigged up a couple of water-barrel rheostats to get a constant load. When the cars shut down at 11:30 we got busy in back of the switchboard. At 3 A. M. I had the meter within one-half per cent. and switchboard connections all restored.

Truly, variety is the spice of life and I am getting lots of spice. Regards to everybody,

Baton Rouge, La., June 16, 1907. H. K. MUNROR.

PONCE, PORTO RICO.

During the last month, we have had plenty of rain, and the sugar and cattle industries are benefiting greatly. In this climate the soil responds at once to moisture and good crops are confidently expected.

General business conditions remain about the same as at last

writing. Compared with April of last year our railway earnings have increased about 16 per cent. and the lighting about 20 per cent.

On Memorial Day, a school holiday here, track games (between the Ponce High School and the Insular Normal School of Rio Piedras) drew a large crowd to the Hippodromo in this city, necessitating the running of extra cars. A noticeable feature of this gathering was the almost universal use of English by the pupils of the schools in cheering and singing for their favorite teams.

On that evening the theatre was crowded to listen to a declamatory contest, in English, between teams from the two schools. All the work was good, but Rio Piedras won the prize for team work, though Ponce took that for best individual work.

Mr. P. F. Hodgkins, lighting superintendent, sailed for home on June 25. It is expected that he will take up similar work at Woonsocket, Rhode Island. Mr. N. J. Waters, formerly cashier in the Boston office, arrived on June 29, to take the position of book-keeper made vacant by the assignment of Mr. Ingham to other work.

Herbert S. Whiton.

FORT WORTH, TEXAS.

Early in May a new form of government went into effect in the city of Fort Worth, Texas. It is what is generally known as the commission form of government, which has been very successful in the city of Galveston and the city of Houston. This form of government in Texas had its inception at Galveston, shortly after the flood, the commissioners for that city being appointed at that time by the Governor to take charge of the city's affairs during the period of reconstruction. It proved so successful that the city of Galveston later amended its charter and adopted a commission. This was followed shortly afterwards by the city of Houston; and now the cities of Dallas and Fort Worth are under a commission form of government.

In Fort Worth the commission consists of a mayor and four commissioners. Each of these commissioners has a separate department for which he is responsible. The new Fort Worth charter gives the commissioners almost unlimited power. The success of this form of government at Galveston and Houston is attributed to the fact that it eliminated a large body of men and placed the responsibility for the government of the city in three

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or four men, each of whom is responsible for his own department, and also to the fact that it has entirely eliminated politics from the government of the city. In Fort Worth the commission consists of business men who have not heretofore been identified with politics, and it is hoped and expected, that this new policy will be a very great improvement over the old.

The commissioners have taken hold very actively, and the good results of their work are to be seen already. Ft. Worth needs paved streets more than any one other thing, and it is the intention of the present commission to push the paving matter as much as possible.

With all its natural advantages, transportation facilities and its new form of government, Fort Worth's future is now undoubtedly assured.

On Sunday morning, May 19, at about 5 o'clock, the dancing pavilion and theatre at Lake Erie on the Interurban line of the Northern Texas Traction Company was entirely destroyed by fire. Arrangements were made immediately for rebuilding it, and on Monday morning, May 27, work was started and the building was completed and opened with a dance on Tuesday evening, June 25, 1907. The original building was a two story structure arranged in the form of a theatre, with a large stage thoroughly equipped with scenery. The present building is a one story structure built on about the same lines, also equipped with a stage, scenery, etc.

Mr. William Jennings Bryan visited Fort Worth Sunday night, June 23, for the purpose of making an address at the Fort Worth Chautauqua. A special car was chartered by the reception committee of Fort Worth, which left Dallas at 7:35, arriving in Fort Worth promptly at 9 P. M.

The standard color of the Interurban and city cars of the Northern Texas Traction Company is orange. This color has been found unsuitable for the Interurban cars, and the company is now experimenting with Pullman green. One of the motor cars and one of the trailers of the Interurban have already been painted in this color. It makes a very much handsomer car and has been favorably commented upon by the people in Fort Worth.

Mr. C. H. Bowen, Superintendent of the Fort Worth division of the Northern Texas Traction Company, has just returned from a three weeks' vacation in Alabama. Mr. Bowen also visited Nashville, Memphis and Atlanta.

EL PASO, TEXAS.

The city of El Paso on April 15, 1907, started operating under the terms of its new charter. The effect is to change the previous government by a board of aldermen elected by wards into a form of the commission system, by which the common council, composed of a mayor and four aldermen, are all elected from the city at large. The salaries of the mayor and aldermen have been increased to \$3000 and \$1800 a year, respectively, and the mayor is required to devote all his time to city business and the four aldermen at least six hours per day.

The boundaries of the city were increased by the terms of the new charter so as to include an additional area of about 925 acres, including parts of Highland and Altura Parks, all of East El Paso and the Woodlawn Park Addition, Washington Park, and the Martinez homestead.

The administration of the city's affairs is vastly more business like under the new charter than it was under the old one, the mayor being at his office all day long and engaged at all times in nothing but city business.

Several regulations regarding public service matters appear in the new charter which were absent from the old. It is provided, for example, that all proposed franchises which contemplate in any way using the streets of the city must be published in full in some daily newspaper one week before they are presented to the city council for action. Then, when a franchise is past its first reading in the city council, it must again be published in a newspaper in its final form before presented to the council for final action. Even after this stage has been reached, a petition signed by 400 advalorem tax payers in the city may require the matter to be referred to the people in a general election.

The city council also reserves the right to regulate or fix the rates which may be charged for any kind of public service, provided that no injustice is done to any company by such regulation. It is provided that any company operating street railway tracks over Dallas, Austin, Newman or Octavia Streets must, at its own cost, construct a viaduct over or subway under the steam road crossing on the street in question. The right is reserved by the city council to authorize any other company than the one originally occupying them to use jointly Davis Street, Overland Street, Santa Fe Street, Mesa Avenue, or Missouri Street. The city council

is also given the right at any time to change the location of the tracks in any street.

Direct responsibility for the various administrative actions of the city government is made more definite than in the past, by the fact that each member of the city council is made by the mayor ex-officio head of various departments of the city, and to these respective heads all of the city officers report. Practically all of the city officers are appointed by the city council instead of being elected by the people, holding their offices only during the pleasure of the city council and not for any specified term. The new charter also provides for the office of meter inspector, an individual who, at the request of any citizen, shall inspect any meter installed by any electric light, gas or water company, or by any other public service corporation.

In the past, the large amount of fine sand in the air of El Paso, with the consequent deleterious effects upon meter jewels and bearings, caused us to start a careful and systematic inspection of our meters. Careful record has been kept for three years past of these tests, and the results obtained in the saving of power lost by slow meters are very interesting.

In the table given below, are shown the results of two years systematic meter testing, the figures compared being the average results for the year 1905 and for the first five months of 1907.

1905	1907
No. meters found slow, per cent43.	22.5
Per cent. slowness of slow meters11.	9.
Per cent. lost from slow meters 4.73	2.03
No. meters found fast, per cent 7.2	13.
Per cent. fastness of fast meters 5.	4.
Per cent. gained through fast meters36	.52
Net loss, per cent 4.37	1.51

It will be seen that during this period the net loss from incorrect meters has been reduced from 4.37 per cent. to 1.51 per cent., or a net difference of 2.86 per cent. of gross earnings, which in the absence of such testing would unquestionably have been lost to the company.

During the year 1907 the amount of our gross earnings which passes through our meters—that is to say, leaving out city lighting and other flat rate business—will amount to about \$200,000, so that the per cent. saved as above mentioned corresponds to an

amount in gross earnings of about \$5700, which would be lost to the company if the systematic meter testing above mentioned had not been carried on. The entire cost of the inspection in order to make this saving of \$5700 is about \$1750 a year, so that the net saving is about \$4000 a year.

The conditions under which meters operate in other parts of the United States are doubtless more favorable than in El Paso; but for this very reason it ought to be possible to obtain for a reasonable cost an increase in gross earnings from the improvement in the correctness of meters which should easily pay for the money spent in testing.

The city council of El Paso has recently passed an ordinance prohibiting all over-hanging signs in this city except electric signs.

One of this company's line foremen, B. B. Rogers, was killed by an electric shock in Juarez on June 17. Rogers was sitting on a telephone cable span while repairing a break in the Juarez are circuit and got 2200-volts to ground between a lighting primary which touched him on the neck and grounded a neutral, touching the key chain in his side pocket. The usual methods of resuscitation were employed on Mr. Rogers for two hours without any result whatever.

This company has received permission from the Atchison, Topeka & Santa Fe railroad to run its wires over or under the railroad company's reservation in El Paso, so as to connect the new power station with the main part of the city.

The Juarez bull ring will be kept open this summer until August 1, by Caro Chico. In previous years the bull fights have terminated with the advent of the warm weather, which is generally about the middle of May; so that the above change will be a material benefit to this company in Sunday earnings.

Mr. M. H. Fliey has been promoted during the past month to the office of chief inspector of this company.

Since January 1, 1907, \$21,000 of treasury bonds and \$85,400 of treasury preferred stock of the El Paso Electric Company have been sold in behalf of the Company through the securities department in the Boston office.

DALLAS, TEXAS.

Some years ago, on account of financial difficulties, the city of Memphis was placed upon government by commission. The success of this temporary measure attracted the attention of the

people of the United States. When Galveston was swept by storm and badly crippled, the same experiment was tried with it and was again a success. From this the cities of Texas began to study the question.

Dallas became interested in the subject and petitioned the legislature to pass a charter embodying this form of government and making it permanent. The charter was approved April 13, 1907, and became effective on that date. It took time, however, to elect and organize a Board of Commissioners provided for in the charter, but on June 1, they took charge of the affairs of the city.

By the provisions of this charter all the usual powers of a municipal government are vested in the city of Dallas. It is provided that all the powers conferred on the city, with a very few exceptions, shall be exercised by the mayor and four commissioners, known as the Board of Commissioners, to be elected by the qualified voters of the city at large and to devote their entire time to the service of the city.

The mayor's salary is \$4000, and the commissioners \$3000 each per annum. They are elected for two years.

The mayor is the chief executive officer and nominates all appointive officers of the city, except the auditor. These nominations are subject to the approval or rejection of the board. This makes the mayor practically responsible for the character of the minor officers of the city.

The commissioners by majority vote divide up their duties. One is known as police and fire commissioner—in special charge of the police and fire department; one is known as commissioner of streets and public property—in special charge of streets, lighting and sanitary condition, and public improvements; one is known as water works and sewerage commissioner, and has special charge of the water works and sewer system; one is known as commissioner of finance and revenue, and has special charge of enforcement of laws on assessment and collection of taxes and of the finances of the city. Each is really the executive officer of his respective department.

The duties of the board and of each commissioner are specifically set out, and the action of any commissioner may be reviewed by the board. Some offices which are to be filled by the board are created by the charter, and then the power of creating offices is conferred on the board.

Wages and salaries are to be fixed by the board and it is required to assemble three times every week in regular meeting. A majority constitutes a quorum for the transaction of business. Special meetings are provided for.

The mayor has the power of recommendation and of veto, and in case of vacancy among commissioners he can nominate and the board elect a qualified person to fill the unexpired term.

A peculiar feature of the charter is the provision for the nomination of an auditor by the presidents of the several incorporated banks situated in the city of Dallas. This nomination must be approved by the board of commissioners; the purpose being to make the auditor independent of the administration. This auditor receives a salary of \$3000, and has the usual powers of an auditor. Provision is made for the election of a school board by the people. The auditor and the school board are practically the only things of importance not under control of the board of commissioners.

The new charter has another peculiar provision, namely, the recall of an elective officer. Thirty-five per cent. of the entire vote cast for mayor in the last preceding election may call for a removal of any officer, and a majority vote will remove such officer.

In addition to the selection of a mayor and four commissioners, the people of Dallas also voted upon themselves a special tax of twenty-five cents on the \$100 valuation, for the purpose of improving streets and side-walks, and additional bond issues amounting to \$650,000. These bond issues are for the following purposes:

For the improvement of waterworks, \$500,000; (it will be remembered that Dallas owns an extensive water plant). For street improvement, \$100,000; for school buildings, \$50,000.

In addition to the bond issues referred to above, the city has just sold an issue of bonds, authorized in August, 1906, as follows: \$150,000 for the construction of a high school building and \$50,000 for ward schools. This, together with the \$50,000 issue authorized at the recent election, gives the city \$250,000 to be spent in school buildings during the year 1907.

It will be interesting to watch the results obtained from this form of city government, and, after the same has been tried long enough to make a fair and thorough test, to compare the same with the previous form of government in this city. Formerly, the city had a mayor and fifteen aldermen with a large number of elective officers, each of whom exercised considerable independent authority.

In the present form of government, as above stated, practically the entire power is with the board of commissioners—the mayor being the chief executive officer with large powers of discretion.

EDWARD T. MOORE.

Dallas is an electrical town. Practically every house, whether of three or of twenty rooms, is wired for electric lights when built. Gas cannot be considered a competitor at present, except in the business section of the city. Electricity is extensively used for power, with the result that there are motors aggregating 4200 H. P. connected; the separate installations varying in size from 1-30 to 400 H. P. The residence district is spread out on all sides of the city, and the lines necessary to carry service to all of these districts are long and complex. In all, 6800 residences are reached. New customers are being taken on at the rate of about 300 per month, and in order to give these customers service promptly, and at the same time to maintain a uniform voltage over the entire system, it is necessary that the line department engineer be continually in touch with the whole situation in all its details, so that he may make proper provisions for extensions of any size.

The proper recording of extensions and the correct noting of line orders and conditions involve a mass of records which at first seem complicated, but which in actual practice, work with perfect satisfaction.

The foundation for all records is a map of the city drawn to a scale of 200 feet to the inch. From this a division is made into twenty-six districts showing secondary services, and twentysix district maps are kept in use. Another division is made into six districts recording the primary and arc circuits, and maps are kept of these as well. Each pole in a secondary district is numbered and its location is shown on the map. A card is kept for each pole, which shows the location and is further made so complete as to provide for the recording of all contacts and other information of value in regard to the pole. The use of this card in detail is not found necessary in practice, except in the case of some down-town corner poles, where the complexity of service makes a graphical statement very essential. In addition to the pole locations, the size of wire and the location of transformers are shown on the secondary map. The regulation of voltage largely depends on the proper loading of transformers. In order to keep a record of this load, a card is kept which shows the history of each transformer. As transformers are connected in bus lines, a bus card is kept which shows the name and address and connected load of all customers taking service from the bus. Tests are made with maximum demand meters and show just what work the transformers are doing. These tests are recorded on the transformer card.

The process of recording a new installation is as follows: A customer makes application for service at a given address, stating the number of lights he desires. A line order is made out and handed to the engineer, who passes upon it, determining whether it is advisable to make the cut-in without previously making provisions for the additional load. If the order is to go through at once, it is turned over to the construction gang and the work is done. After making a connection, the lineman who does the work makes a notation on the line order, showing the number of the pole to which connection is made and the number of the transformer or bus from which service is taken. The line order is returned to the engineer department and the data for their records is filed. In case the engineer does not approve of making the installation without preparing for it, he holds the line order up and makes a recommendation as to the work required and presents it to the superintendent. After approval it goes to the construction department, and the work is then done. Complaints of poor voltage are referred to this department and recommendations are received from them as to necessary repair work.

The department has been in operation for about six months, and the results go to show that in sections of the city already completely recorded the company is giving better service, and it is believed that the labor expended in this direction is well repaid.

The department is under the direction of Mr. J. B. Conant, who is at the head of the meter department as well. He was formerly with The Lowell Electric Light Corporation, Lowell, Mass.

H. L. WINCHESTER.

Shortly before noon on June 13, 1907, there occurred, at the crossing of our Commerce street line with the Houston & Texas Central Railroad tracks, a rather unusual accident, which but for the heavy construction of the car might have proved to be a very serious one. As it was, however, no one was seriously hurt, although several persons made claims for bruises of different kinds.

The accident occurred in the following manner: A North

Belt car going east on Commerce street had made the usual 100 foot stop and had proceeded to within a few feet of the crossing, when it stopped to await the passing of a freight train which was moving slowly north. When the end of this train had cleared the crossing and reached the sidewalk line, our conductor received what he thought was a signal from the brakeman to bring his car across the tracks. Before the street car had cleared the crossing, however, the train began to back down and struck the car about 10 feet back of the center, throwing it nearly on its side and across our tracks.

The engineer of the freight train claims that he thought the signal given by his brakeman was to back his train.

The street car was damaged only to the extent of about \$50, which, in view of the hard blow received, is very remarkable. We attribute this to the fact that the car has steel I beam sills, which, although they received the full force of the blow, were simply dented at the flanges, while the beam proper was not sprung at all.

Very soon after the accident the claim departments of both companies were on the ground, and after a preliminary investigation was made the conduct of our trainmen was shown to be such that the claim department of the H. & T. C. R. R. practically admitted the liability and proceeded to settle the claims on their own account, reserving the right to arbitrate the question with our company at some later date, in case it should develop subsequently that the steam company was not wholly at fault.

EDWARD T. MOORE.

Mr. B. E. Van Vliet, formerly general bookkeeper for the Dallas companies, has been transferred to the Boston office. Mr. Van Vliet became connected with one of the street railways in Dallas some ten years ago, first serving in the capacity of office boy and transfer counter, later as cashier, purchasing agent; and one year ago he was made general bookkeeper for the several Dallas companies. In addition, Mr. Van Vliet was, for several years, treasurer of the Rapid Transit Railway Company of Dallas.

To the vacancy created by the transfer of Mr. Van Vliet to Boston, Mr. C. F. Kirchhaine has been appointed. Mr. Kirchhaine began his street railway career in Dallas some ten years ago as a motorman during a strike. From the cars he was transferred to the car barns where he remained two years, at the end of which time he occupied the position of night barn foreman.

Later he was transferred to the general office, and from time to time was employed in different branches of the local accounting department until the recent promotion placed him as general bookkeeper for all the Dallas companies.

The City Commission in Dallas, Texas, has recently passed an ordinance requiring all electric signs to be burned from dark to 10 P. M. from May to September, and until 12 P. M. from September to May.

HOUSTON, TEXAS.

The unusual heavy storms of the month of May culminated in a very severe electrical and rain storm on May 30. For 48 hours a terrific down pour continued, which swelled the streams about the city to such an extent that Buffalo Bayou rose 25 feet above normal tide. During the storm 7.55 inches of rain fell, or an amount equal to that which fell in January, February, and a part of March. All of the manufacturing concerns along the banks of the bayou were forced to shut down. The bridges over the entire city were flooded and thousands of dollars worth of damage done to them.

This is the heaviest storm that Houston has had since 1879, and its suddenness and intensity surpasses anything within the recollection of the oldest inhabitant.

The water compelled us to shut down the power plant at 11 A. M., on May 30. From this time until 5 P. M., we ran one car on six lines. At 5 P. M., seeing that the water had reached its height, we put on six more cars. This service was continued throughout the night. On the morning of the 31st, with additional power secured from the Lighting Company, we got out 21 cars, which we ran until 1 P. M., at which time we were able to start up the two big machines non-condensing, which we did for 24 hours, when the water receded sufficiently to start the condensers.

However, we are pleased to report that no damage was done to any of the power-house equipment. The loss which we suffered at our power house was due to the loss in efficiency of the large engines running non-condensing, loss of lubricating oil, purchasing of additional power from the Houston Lighting Power Company, and miscellaneous expenses in fighting water.

The public, as a whole, took the interruption to the service with the philosophical good humor characteristic of the American public on such occasions, and half of the town knocked off work to throng the banks of the Bayou for a glimpse of the wonderful and unexpected "deep water" that had come to Houston so far in advance of congressional appropriations and United States engineers. This storm of the latter part of May seems to have been the grand finale of the long, cold, wet spring, which had almost ruined a great proportion of the cotton crop. During June, hot, fair weather has prevailed and has restored the condition of the principal source of wealth, namely, the cotton crop, to such an extent that competent observers predict a fair if not a good crop for the state during the coming year. The corn and rice continue to be in excellent condition.

A. W. Q. Birtwell has been promoted to the position of assistant treasurer of the Northern Texas Traction company at Fort Worth, and his previous position has been filled by the promotion of Harry L. Harding, former chief clerk of this company.

K. S. Mandell, formerly of the Boston office, who has been in Houston since the first of February, 1906, has been promoted to the desk of chief clerk.

In the transportation department, Wesley Wentworth, general superintendent, in charge of the power house, car barn, track and overhead and operation of the cars, has been succeeded by Uriah Foss of New Britain, Connecticut, with the title of superintendent of transportation in direct charge of the operation of the cars. By this change in the organization the following positions now report to the manager:

Superintendent of transportation, in charge of the inspectors and the operation of the cars while on the road;

Master mechanic, in charge of the whole car barn plant; Claim agent;

Maintenance engineer, in charge of track and overhead;

Asst. treas., in charge of the office, and

Gravel Superintendent, in charge of the gravel pit lying approximately 100 miles west of Houston.

On June 8 F. M. Dowden, inspector, resigned to take a positition with the United Railways of San Francisco. His place is being filled temporarily by J. M. Angel, as acting inspector.

At the power house, D. M. Sherwood, oiler, was promoted to the position of assistant engineer to succeed J. L. Le Cour, resigned.

On Sunday, June 9, the "lid" was lifted from Houston, after

having been "screwed on tight" for over three weeks. During this period of puritanical reform, which generally accompanies all Sunday closing movements, no soda-water, candy, cigars or other small articles were allowed to be sold throughout the city. All concessions at Highland Park, which is owned and operated by this company, were closed, with the exception of the roller coaster, which did a thriving business. As a result of this closing movement, approximately between two thousand and twenty-five hundred people left Houston each Sunday for Galveston to quench their thirst and have a good time. The loss of business was so apparent that the citizens began to take action, and a petition with eight thousand signatures was presented to the commission asking that all dealers, except saloons, be allowed to resume business actively on Sunday. This petition was granted on Sunday, June 9. Theeffect of this Sunday closing was very perceptible on our Sunday receipts, which were decreased, it is believed, 5 per cent on account of people leaving the city for Galveston and the practical closing up of Highland Park.

On June 12 the Citizens' Alliance of Houston completed the third year of its existence. The annual report of its officers showed the association to be in a flourishing condition, financially and otherwise. The report of the president, Mr. J. V. Neuhaus, as submitted, is as follows:

"In presenting to you my annual report as president of this organization it affords me great pleasure to call attention to the past year as one remarkably free from the disturbances of previous years arising out of lack of harmony between employer and employed. A number of causes have contributed to bring about this condition, but it is possibly not too much to claim that the credit is in a large measure due to the quiet endeavor of this association to bring about a clearer understanding of the mutual interdependence of the laboring class and the employers.

"There have been several attempts on the part of the leaders of some of the organized labor bodies to enforce unfair and unjust combinations upon the people, but for the most part these efforts have failed, not alone through the weight of popular condemnation, but through the realization on the part of the members themselves of the inadvisability of making unjust demands.

"It must be apparent to all thinking men that for a movement for the betterment of labor to succeed it must be based upon principles of justice and must not be antagonistic to the welfare of the people at large or to the liberties of workmen in general.

"It has been the policy of the alliance to impress upon all the fact that it does not occupy a position antagonistic to organized labor, per se, nor is it an exponent of low wages, but that it does emphatically insist upon guaranteeing to every man the right to labor in peace whether a member of the union or not. The principles of personal liberty of action are the cardinal principles of the 'open shop,' and for this the association has exerted its most earnest efforts.

"The 'open shop' is slowly, but surely, extending in all lines of activity, and when established the relation between employer and employed will be eminently satisfactory to both sides.

"I feel in this connection, that I cannot impress upon the members of this body too strongly the advisability and necessity of applying to their own business affairs the principles of 'equal justice to all' and other doctrines for which this organization stands.

"The general condition of the alliance was never better, and though it may have appeared to some members that the association has been so quiet as to presuppose lethargy, yet the bettered conditions of Houston, which all must admit, are largely due to the persistent and active efforts of the organization to carry out its principles."

The Citizens Alliance was one of the most powerful factors in bringing to a satisfactory conclusion the strike of the trainmen of the company in June, 1904.

During the latter part of June, the two-masted schooner Simpson arrived in Houston from Key West, Fla., via Buffalo Bayou. This is one of the largest schooners in the Gulf coast trade, and it has been making alternate trips from Morgan City to Key West. It will make regular trips between Houston and Key West, landing at the foot of Main street in Houston. The entrance of this large boat into the heart of Houston shows how near Houston is to deep water.

The city of Houston has decided on an annual appropriation of \$50,000 to be expended on the channel between Houston and Longreach at Harrisburg. From Longreach to the Gulf of Mexico, the United States Government is maintaining 18 feet of water, which it is hoped will be extended to 25 feet by future congressional appropriations.

The telephone situation in Houston is rather curious. In addition to the Southwestern Telephone & Telegraph Company (the Bell Co.) and an independent citizens' line, a franchise is being granted for an automatic telephone, so that we are facing the pleasant prospect of having three telephones on our desks to keep in touch with all portions of the city.

On July 12 the anti-free pass law enacted by the last State legislature goes into effect. By the terms of this law no one may ride on the cars of the Houston Electric Company except employes and their immediate families, city firemen, policemen, sisters of charity, representatives of charitable organizations, post-office and mail inspectors, our attorneys, and the directors of this company. As a result of this wholesale slaughter of the free passes, there is "weeping and wailing and gnashing of teeth" among some 200 of our friends, who have been in the habit of using some \$8,000 to \$10,000 worth of transportation annually.

DAVID DALY.

SEATTLE, WASHINGTON.

[Extract from a personal letter from Mr. Charles D. Wyman, dated July 2, 1907.] I wish you could see this country and note its wonderful growth. The people here, while they read about tight money and hard times in the East, have no personal appreciation of such a condition, for business enlargement—the building of greater factories and the extension of new enterprises—seems to go on without any hesitation. Talking with some of the prominent men of the city yesterday, they said that there was some halting apparent in the real estate market. No special reduction in price was noticeable, but simply somewhat of an indisposition on the part of the public to buy. This, however, was, in their opinion, due to the fact that, on account of the incoming of the new steam railways, real estate prices had been pushed up to a rather extreme height. On the other hand, all the merchants and manufacturers report a better business now than they enjoyed last year. There is hardly a house which can be rented in the city, and every new structure, either residence or office building, is tenanted immediately upon completion. I wonder how long this condition is to last. Certainly there is at present very little indication of a falling off. CHARLES D. WYMAN.

The business of The Seattle Electric Company continues to increase over the business done last year, by a very handsome

amount. Our parks are now open, and a very large amusement park, built by private capital, has just been opened in West Seattle, across Elliott Bay, which is very attractive and which had an attendance on Sunday of about eighteen thousand. This park is served both by steamers on the Sound and by the street car system of this company, which has been in process of construction during the past few months.

We have all enjoyed the visit of Mr. Charles D. Wyman, of the executive committee, and sponsor to the firm for all of the Puget Sound companies. He arrived in Seattle on June 12, and expects to get through with his business in this section and return to Boston, arriving about the sixteenth of July. While he has been here the Puget Sound properties have been looked over very thoroughly by him, including the proposed route of the new Puget Sound International Railway & Power Company, which has just been incorporated to build interurban roads from Bellingham north to the British Columbia line and south to connect Everett and Seattle with the existing interurban between Seattle and Tacoma, and for further development south of Tacoma. Mr. Wyman has expressed himself as much pleased with conditions as he has found them in the Puget Sound companies, both as to present and prospective business. A great deal of interurban territory has been gone over with automobiles, and interviews have been had with bankers, merchants and city and town authorities in the various cities and towns which will be included in this new interurban development; so that Mr. Wyman has been able to gain a very complete knowledge of the situation.

While here Mr. Wyman has announced through the public press the intention of Stone & Webster to take over the Everett Railway, Light & Water Company. Everett is a port on the shore of Puget Sound, about thirty miles from Seattle and sixty-five miles from Bellingham. It is a large lumber manufacturing center, has a large smelter for the reduction of copper and other ores, and in one of its suburbs a large paper mill, and is a thriving, growing city of about twenty-five thousand. The company is in prosperous condition and will be a very attractive addition to the Stone & Webster chain of properties in the State of Washington. It is now expected that the property will be taken over on the first of August, but there may be some delay in the actual date.

Construction work by The Seattle Electric Company is pro-

gressing rapidly. The new 3,000 Kw. turbo-generator for the Georgetown power plant was ready to turn over the latter part of June; but after a few days running it developed some weakness in the coils of the generator, and a burn-out was caused, which is now in process of repair. It is expected that the company will be able to begin removing from its old to its new shops within the next thirty to forty days.

H. F. Grant.

BELLINGHAM, WASHINGTON.

In November, 1905, at that time operating the street railway and gas properties and also doing a small portion of the electric lighting business, the Whatcom County Railway & Light Company secured the control of the electric lighting property operated by the Bellingham Bay Improvement Company, since which time numerous improvements have been made in both the business and operating departments. We found, on taking over the property, that new business possibilities had been neglected, particularly that of electric signs, the possibilities of that branch having been entirely overlooked.

In the spring of 1906 a vigorous campaign was begun, and today there are in service seventy-seven electric signs. These are all trough or outline letters—not transparencies. The total installation amounts at this time to 5,879-2 cp., 13 watt lamps, burning every night from dusk to midnight, on flat rate contracts, averaging approximately \$110. per hp. of connected load per year.

In order to induce the installation of a large portion of these signs, we found it necessary to adopt the very liberal policy of paying one-half the cost of the sign, the hanging, connecting and lamps being furnished free under two year contracts. In this way we have been able to install only the most substantial trough and outline letter signs, the first cost of which (one-half usually being paid by the company), exclusive of lamps and hanging, has been as follows for 16 inch letters*:

^{*}Average number of lamps per 16 inch letter 6.

²⁴ inch Letters, 30 per cent additional.

³⁰ inch Letters, 50 per cent additional.

³⁶ inch Letters, 60 per cent additional.

Special designs extra.

No. of Letters.	Per Letter
6	\$ 6.00
8	6.00
10	6.00
12	5.50
14	5.50
16	5.25
18	5.00
20	4.75
22	4.50
24	4.50

Among the signs installed are several roof and "across the street" signs, among them being three that are 40 feet long, 9 feet high, with 6 foot letters. The "across the street" signs are specially constructed individual block letters, substantially hung on wires, and have a very imposing appearance.

The population of Bellingham is approximately 32,000, and it will be noted that we have now reached the average of one sign to every 416 inhabitants, a record we consider very satisfactory.

In addition to the sign business we have increased the commercial business very satisfactorily. The November earnings for this year will show an approximate increase of 80 per cent over November 1905.

We shall be very glad to give further information in regard to this to any of the Stone & Webster companies.

Mr. Charles D. Wyman, of Boston, who is on his annual visit to the coast properties, and Mr. Howard F. Grant, district manager for the Puget Sound companies and manager of The Seattle Electric Company, spent three or four days in Bellingham the latter part of June, arriving on the 26th and returning to Seattle on the 30th. On Thursday, June 27, they were the guests of Mr. E. W. Purdy, President of the First National Bank, who entertained them on board the steamer Callendar, of the Pacific American Fisheries fleet. The day was most enjoyably spent among the beautiful islands of Puget Sound. Fourteen representative business men were entertained.

On Friday, Messrs. Wyman and Grant visited the Nooksack Falls power plant with L. H. Bean, manager of the Whatcom County Railway & Light Company, and S. L. Shuffleton, cons-

tructing engineer for the Stone & Webster Engineering Corporation. Saturday was spent in discussing matters in connection with
the local company and planning future improvements. On Sunday Mr. Wyman visited the fertile Skagit Valley, the many
prosperous towns of which Messrs. Stone & Webster are planning
to connect with an interurban, to be constructed by the recently incorporated Puget Sound International Railway & Power Company.
It is proposed to extend this line northward to Bellingham. On this
trip Mr. Wyman was accompanied by Mr. Howard F. Grant, L.
H. Bean and E. W. Purdy, and a thorough inspection of the rich
valley was made. At Burlington the party met with a hearty reception at the hands of the mayors of several of the towns, county
officials and prominent bankers, all of whom are ardent supporters
of the proposed line.

Mr. Leslie R. Coffin, Lawrence Scientific School, 1906, who spent a year in the Boston offices, arrived in Bellingham in May and has joined the forces of this company as a student. Mr. Coffin will be afforded the opportunity of studying the operation of a combined street railway, gas and electric lighting company.

Mr. John C. Hector, assistant treasurer, is looking forward to a visit to Boston in October, to be present at the proposed meeting of assistant treasurers of the Stone & Webster companies.

\$13,000 of treasury preferred stock of a larger amount recently offered for sale has been sold in behalf of the company through the securities department in the Boston office.

PUGET SOUND ELECTRIC RAILWAY.

Since January 1, 1907, \$75,000 of treasury bonds have been sold in behalf of the company through the securities department in the Boston office.

SYDNEY, CAPE BRETON.

One of Sydney's industries, the Dominion Iron & Steel Company, has just published its report for the year ending May 31, 1907. It shows net earnings of \$2,247,536, and net profit of \$1,563,151. The company employs three thousand men, and has an average pay roll of \$175,000 per month.

It is interesting to note, in connection with this, that in the territory served by the Cape Breton Electric Company, Limited, and the Sydney & Glace Bay Railway Company, Limited, there is a monthly pay roll of approximately \$750,000.

During the last twelve months our lighting load has increased by about 16 per cent, and our power load, including contracts on order, shows an increase of about 300 per cent. We sell motors at actual cost to consumers, and when necessary, put a motor out on trial to back up our statements, as was done in the case of the Globe laundry, which has been our hardest proposition. We put in a fifteen horse power motor, and demonstrated that a motor was cheaper than a steam engine, even when they had to have steam for washing and drying, and also for heating a block of about 40 rooms eight months in the year.

The Sydney & Glace Bay Railway Company, Limited, of which company we own one-half, is to install a new power station in Glace Bay, fifteen miles from Sydney. The new installation will include 2 150 H. P. boilers and a 375 H. P. engine, direct connected to a 250 K. W. generator. This, with their present equipment of 150 Kilowatts, will give them a much needed capacity.

We expect next month to install a new boiler in the steamship-"Peerless," one of our ferry boats running between Sydney and North Sydney.

Summer is just opening here. The Sydneys, and in fact the whole island of Cape Breton, are fast becoming popular with the tourist. The scenery is beautiful, yachting, boating and bathing are good, and splendid salmon and trout fishing can be obtained at hundreds of places in the island. The whole island of Cape Breton is year by year becoming better recognized as the summer paradise of Canada. It must be seen to be enjoyed. We have a flourishing yacht club here of about 120 members, of whom about twenty have yachts, and about fifteen motor boats.

Newfoundland is only ninety miles from North Sydney. The steamer "Bruce" makes the trip in six hours. Newfoundland has some of the finest salmon streams in the world. Some of our prominent merchants in Sydney have just returned from a fishing trip in Newfoundland, and they report salmon and trout very plentiful, and the weather fine.

Messrs. F. S. and A. S. Pratt of the Boston office visited us during June.

QUOTATIONS

ON

SECURITIES OF PUBLIC SERVICE CORPORATIONS

UNDER THE MANAGEMENT OF STONE & WEBSTER

JULY 1, 1907

NOTE:—Quotations are approximate. Unless indicated to the contrary Bonds and Notes are 5 per cent and preferred stocks 6 per cent non-camulative. Bonds are sold plus accrued interest.

COMPANY	BONDS	PREF.	OOM.
Blue Hill Street Railway Co., The	100	No pref.	••••
Brockton & Plymouth St. Ry. Co.	100	No pref.	••••
Cape Breton Electric Co., Ltd.	90	83	25
Columbus Electric Co.	94	• • • •	••••
Columbus Power Co., The	96 9 5	2	16
Dallas Electric Corporation	98	70	26
Edison Elec. Ill. Co. of Brockton	10 0 100	No pref.	••••
El Paso Electric Co.	97	95	50
Fall River Gas Works Co.	No bonds	No pref.	285
Galveston Electric Co.	98	90	40
Galveston-Houston Elec. Co,	••••	90	40
Houghton County Elec. Lt. Co.	100	23	15
Houghton County St. Ry. Co., The	90	95	25
Houston Electric Co.	99	90	40
Jacksonville Electric Co.	100	99	90
Key West Electric Co., The	••••	2	••••

COMPANY		BONDS	PREF.	OOM.
Lowell Elec. Lt. Corporation, The		105	No pref.	195
Minneapolis General Elec. Co., The		104	108	100
Northern Texas Electric Co.		98	801/2 11	381/2
Paducah Traction & Lt. Co.	i1	90	60	18
Pensacola Electric Co.		95	871/2	25
Ponce Electric Co.		100 7	No pref.	••••
Puget Sound Electric Railway	too	100 9434	87 Ex. div.	55
Puget Sound Power Co.	-	102	No pref.	15
Savannah Electric Co.	9	98	88	121/2
Seattle Electric Co., The	3	10 \$ 100	96	86
Tacoma Railway & Power Co.		100	No pref.	
Tampa Electric Co.		No bonds	No pref.	183
Whatcom County Ry. & Lt. Co.	_	95	88	49

1.—Cumulative. 2.—No dividend yet paid. 3.—Bonds of Northern Texas Traction Co. 4.—5 per cent. 5.—Cumulative after Dec. 1, '07. 6.—1 per cent paid Dec. 1, '0 and June 1, '07. 7.—6 per cent. 8.—Par \$28. 9.—Listed Boston and Louisville. 10.—Listed Boston. 11.—Listed Louisville. 12.—Listed Columbus, Ohio. 18.—Listed Boston, Columbus Ohio, Louisville. 14.—Listed Louisville, Columbus Ohio. '15.—Held by Seattle Electric Co. 16.—Held largely by Columbus Elec. Co. 17.—Held by Puget Sound Elec. Ry. 18.—4½ per cent.

STONE & WEBSTER Securities Department

OFFICES:

Boston - - - 84 State Street Chicago, 604 First National Bank Bldg.

NOTE. — The Securities Department handles securities for those-wishing to purchase or sell, keeps accurate quotations, and gives out information about above companies.

Miscellaneous Notes

GALVESTON-HOUSTON ELECTRIC COMPANY

In order to increase the rapid transit facilities between the cities of Galveston and Houston, and to assist in the local development of the systems in each city, Stone & Webster have decided to construct an interurban road over the forty-five miles between them. A company called "Galveston-Houston Electric Railway Company" has been organized to construct and operate this road.

In order to make the three properties,—the two terminal companies and the interurban,—as homogeneous as such an interwoven system naturally should be, another company has been formed,—namely, Galveston-Houston Electric Company—which will acquire all of the capital stock of the interurban company, and which will have an authorized capitalization of preferred and common stock equal in amount to the aggregate of the preferred and common stocks authorized by the two terminal companies. It has been made optional to the stockholders of both the Houston Electric Company and the Galveston Electric Company to exchange their holdings, share for share, for stock of the Galveston-Houston Electric Company. The preferred stock of both the Galveston Electric Company and Houston Electric Company is noncumulative, while the preferred stock of the Galveston-Houston Electric Company is cumulative. No preferred or common stock will be issued by the latter company in excess of the amount of Houston Electric Company and Galveston Electric Company stock surrendered for exchange.

Surveys have been made and considerable preliminary work has been done toward the construction of the interurban. The territory between the cities is practically level, with a stretch of open water which will have to be bridged, just north of Galveston. The line will run on a private right of way, and actual construction will be begun as soon as various further preliminaries have been attended to.

COUPONS AND DIVIDENDS DUE

	Per	cent.
Aug. 1st, Fall River Gas Works Co., capital		
stock		5
An extra dividend of \$20 per share has		
been declared payable to stockholders of		
record July 15th.		
Aug. 1st, Houston Elec. Co. 5's	1925	2 1-2
Aug. 1st, Houston Elec. Co. pfd. stock		3
Aug. 1st, Jacksonville Elec. Co. pfd. stock	-	3
Aug. 1st, Jacksonville Elec. Co. com. stock	•	3
Aug. 1st, Key West Elec. Co., The, 5's	1956	2 1-2
Aug. 1st, Lowell Elec. Light Corp., The, capital		
stock		2
The Company will pay dividends on this		
stock quarterly, instead of semi-annually, as		
heretofore.		
Aug. 1st, Minneapolis Gen. Elec. Co., The, pfd.		
stock	6 per cent.	3
Aug. 1st, Minneapolis Gen. Elec. Co., The, com.	P • • • • • • • • • • • • • • • • • • •	
stock		2
Aug. 1, Pensacola Elec. Co., 5's	1931	2 1-2
Aug. 1st, Puget Sound Elec. Railway, 5's		2 1-2
Aug. 1st, Puget Sound Elec. Ry. coupon notes,		
5 per cent		2 1-2
Aug. 1st, Seattle Electric Co., The, 5's		2 1-2
Aug. 1st, Seattle Electric Co., The, coupon		
notes, 5 per cent		2 1-2
		/-

A UNIQUE SITUATION

One of the few times a public service corporation has ever been publicly commended by any city official occurred recently. See the following extract from the Annual Report of the mayor of Houston:

"Before submitting to you the Annual Budget, I desire to call your attention to the great expenditures and improvements that our public utility institutions are making throughout the city. The electric light company is about to commence to place their underground conduits in the business portion of the city. The gas company has extended miles of mains and laterals during the past year, reaching hundreds of consumers that heretofore had no such facilities. The street car company is expending hundreds of thousands of dollars in betterments, which not only emphasizes their belief in the future of Houston, but guarantees increased and better accommodations to the traveling public.

"All of these institutions have consistently and promptly carried out, to the best of their ability, at all times, suggestions made by this Commission, and it is at least proper for me to state that the managers of these several utilities have shown an earnest desire and willingness to co-operate with this government for the successful development of this city."

LIBRARY OF STONE & WEBSTER

Current Literature References

References Like These Samples Are Issued About Twice a Week in Mimeograph Form.

- SEMI-WEEKLY SPECIAL 6|12|07 extra (20 cont'd) No. 133-07 A (20 cont'd)—Relative merits of three-phase & one-phase transform-
- ers. Abs HWTobey, JSPeck, AIEE. 477-2.6p-WE-6|1|07

 B Relays for the control of high-tension switch gear. Abs CCGarrard.

 (Lond Elec Egrg, 4|26|07) +1116-1.2p-EW-6|1|07
- C Synchronizing rotary converters. JacobGlogau. +286-2p-"Electrocraft"-6|07
- D Elementary el'i egrg. XVII. Principles of the apparatus employed for starting d c motors on constant potential circuits. CPPoole. *+360-2.1p-P-6|07
- E Treatment for el'I shocks. RichardLee. 999-0.3p-EMJ-5|25|07
 F Ozone: its nature, production & uses. JHBridge. *+355-26p-FI-5|07
 G Ac generators. Notes on their constrn, performance & operation.
 PMLincoln. *304-7.2p-SRB-5|07
- H Commutator constrn. III. (Cont'd) Repairing commutators. *+515-2.7p-ETW-5|30|07
- I Commutating poles in dc machinery. *+952-2.9p, Ed 932-0.4p-EW-5|11|07
- J Problems in commutation. Commutation & dc design. MilesWalker. *+276-14, Ed 243-6p-EJ-5|07 K VACATION LITERATURE.
- - See No. 132|07 (V-Z) for some 1907 accessions. Comparatively few changes have as yet been made from the 1906 list, which may be seen with the collection of folders, etc, in the Library. Duplicates of Boston & Maine & other publications to be given away. Inquire immediately of Library
- L Tests of a 500-kilowatt turbo-alternator. Abs HLRice & WMWillett.
- *÷623-1p-ERR-5|11|07
 M Pr factor. Abs WESumpner. (Lond Elec Egrg 5|2|07) 1117-0.5p-EW-6|1|07
- N The pr pit of the Cleveland, O, Arcade Co. Compact and efficient. HWWoodward. *523-3.5p-Er-6|1|07
- O Blondel's system of arc itg. IsidorLadoff. (concid.) Examination of an arc lp "system Blondel." WWedding. +200-5p-IE-5|07
- P Wiring plans for household htg devices; summary of Natl El Code Rules. FMFeiker. *+877-3.3p-ERa-6|1|07
- Q El cooking by Manhattan El Range Ce, N Y. Time required. 1125-0.5c-EW-6|1|07

- R On the determination of the mean horizontal intensity of inc ips by the rotating lp method. EPHyde & FECady. *+415-22p-BBS-12|06. *0711.Un3
- S Preliminary measurements on temperature & selective radiation of inc. lps. CWWaidner&GKBurgess. +319-10.5p-BBS-12|06. *0711.Un3
- T Practical illmn. A new book on the art of illmtg. JRCravath & VanRLansingh. (r) 549-0.9p-EN-5|16|07
 U Comparative costs of gas & el ltg. Abs EGKennard. (Lond Elec Egrg, 4|19|26 & 5|3|07.) 1114-07c-EW-6|1|07
- V Co-operative itg of sts by merchants. Methods adopted by Houghton County El Lt Co. FGBolton. *1111-1p-EW-6|1|07
- W A comparison of the unit of luminous intensity of the U S with those of Ger, England & France. EPHyde. *65-16p-BBS-4|07
- X The compensated two-circuit electrodynamometer. EBRosa. 15p-BBS-4|07
- Y Definitions of some units used in illmtg egrg. Abs WAEvans, PS, IEE. +241-6.2p-1E-5|07
- Z A new type of graphic recording meters. HWYoung. *+886-3.3p-ERa-6|1. (Cont'd in No. 134)
- **SEMI-WEEKLY SPECIAL** 6|15|07 (20 cont'd)—(30) No. 134-07 A (20 cont'd)—First an con of illmtg Egrg Soc will be held in Boston, 7|30-31|07. 507-0.5c-WE-6|8|07
- B Recent progress in arc lamps; flame arcs; comparative table of consumption & efficiency. Abs Blondel. +230-1p-SAb-5|25|07 C Experiments with magnetite electrodes. Abs WEminger. 2
- 6p-SAb-5|25
- D Lt standards & high-voltage glow-ips. Abs CCPaterson. +231-2p-SAb-5|25|07
- E Temperature & It-emission of carbon, osmium & tungsten ips. Abs AGrau. +235-1.2p-SAb-5|25|07
- F Measuremt of instantaneous values of el its on alt cur. Abs Johann Sahulka. (From Elek und Masch.) +262-1.7p-Eln-5|31|07
- G EI htg without special concessions from the central station. CDWoodJr, NELA. Some recent applications of htg devices. *+506-0.9p-WE-6|8|07
- H Modern methods of photometry. VictorQuittner. *+26280-1.4p-SAS-6|8|07
- Value of scientific tests to pub ser corpns. ACScott. 14-1.5p-SE-5¦07
- J Hot-wire wattmeters & oscillographs. Abs JTIrwin, IEE. 0.5c, +266-1.9p-Eln-5|31|07 K The induction motor. CJSpencer. 231-3p, Ed 225-0.4p-EA-5|07
- L Hydro-el pr vs stm for indust'l plts. III-Typical modern stations & opportunities inviting develpmt. HvonSchon. Data of undevelp'd water pra in America. *+353-23p-EM-6|07
- M El pr from Niagara at 50s. per h-p-year. 39-0.5c-ES-5|31|07
- N Design & constru of hydro-el pits. RCBeardsley. (r) 692-0.4c-ERd-6|8
- O Kern River Station No 1 of the Los Angeles Edison El Co. +417-3.3p-JEP-6|1|07
- P The Gt Fails station of the Southern Pr Co. II. Generators; transformers; switchboard, etc. CAMees&JHRoddey. +622-2.7p-ERd-5|25|07. III. Transmsn lines; towers, etc. A typical hydraulic develpmt. *+651-2p, Ed 641-0.5p-ERd-6|1|07
- Q Develomt of the McCali's Ferry Pr Co. Outline of a mammoth pr scheme on the Susquehanna River. DAWilley. *873-3.7p-ERa-611107
- R Hydro-el develpmts on Catawba River, SC, at Gt Falls. Transformers; switches; wooden poles, etc. *+1025-4.5p, Ed 1016-0.7p-EW-5/25/07.

- S Pr transmen lines. West Shore R R. *1000-1p-SRJ-6|8[07
- T The use of wooden poles for overhead pr transmsn. Results of a series of tests. (concld) CWade & dis, IEE. +135-2.4p-Eln-5|10|07
- U El'y as a cause of fires. Abs rep El'l Bur Natl B'd Fire Underwriters. 534-0.8c-EN-5|16|07. (No. 127, T.)
- Wittels. 532-0.5224-515151. (Adv. 121, 7.1)

 V (30)—The use of stm in gas-producer practice. Abs WABone, ICE. +659-5.1p, 639-1p-Eg-5:17|07

 W Stm in gas producer practice. Abs WABone & RVWheeler, ISI. *+929-4.2p-AG-6|3|07

- Y Producer gas engines. Result of tests made by U S Geol Survey.

 Abs GWBissell, IEA. +955-0.7p-EW, +616-1.7p-ERR-5|11|07

 Y Suction producer gas, its formation & economy as a means for generating pr in the modern producer gas engine. JHClapperton.

 *+613-5.5p-CS-6|07
- Z First Rateau regenerator installed in America. Description & test of Rateau low-pressure turbine system at works of Internat'l Harvester Co, Chicago. FGGasche. *+364-7.5p-P-6-07. (Cont'd in No. 135)

STONE & WEBSTER

84 STATE STREET, BOSTON

General Managers of

The Lowell Electric Light Corporation The Seattle Electric Company Puget Sound Electric Railway Columbus Electric Company Cape Breton Electric Company, Ltd. El Paso Electric Company Jacksonville Electric Company Ponce Electric Company Northern Texas Electric Company The Minneapolis General Electric Company Edison Electric Illuminating Co., of Brockton Houghton County Electric Light Company Brockton and Plymouth Street Railway Company The Houghton County Street Railway Company Whatcom County Railway and Light Company Savannah Electric Company Dallas Electric Corporation Paducah Traction and Light Company The Blue Hill Street Railway Company Fort Hill Chemical Company Tampa Electric Company Pensacola Electric Company The Key West Electric Company General Electro-Chemical Company Houston Electric Company Galveston Electric Company Fall River Gas Works Company

STONE & WEBSTER PUBLIC SERVICE JOURNAL

SEPTEMBER, 1907

EDITORIAL COMMENT

A year or more ago, Judge Grosscup of Chicago, who had been commending himself to the good sense of the nation by his public utterances with reference to corporations, let fall some words which subsequent events have made even more impressive than when first uttered. "What is the sensible thing to do?" he asked. "Destroy the corporation? Harass it? Hobble it? Not at all. The sin in our corporate domain is not the legal structure known as the corporation. The corporation, pure and simple, is only a legal form under which men may associate their means together for a common purpose. It is the only way in sight to do great material things." All this would seem to be a mere truism. And yet the principle involved, though of the most elementary character, is like a good many other elementary principles, easily obscured. That fact is more strikingly attested today than it was twelve months ago.

No one is so courageous as to want to destroy the corporation. In many quarters there is, however, a strong disposition to "harass" and "hobble" it. True, this is merely the excess of righteous zeal; but zeal without knowledge, as we have been taught

on highest authority, is a dangerous thing. It is frankly admitted that there are good corporations as well as bad, and that the good probably greatly outnumber the bad. Nevertheless, the bad are such a factor for evil in our industrial and social life that they must be brought up at short turn, even if it is necessary to "harass" and "hobble" the good to effect this end.

The wisdom of such a policy may be seriously questioned. If no one were to suffer from the vicarious punishment of the good corporations but the members themselves, their treatment, though not morally justifiable, would work scant harm to the public. But that would by no means be the extent of the suffering. For, as Judge Grosscup has said, the corporation "is the only way in sight to do great material things." These great material things will be left undone to just the extent that the corporations are "harassed" and "hobbled." Everyone must hope for the speedy deliverance of the nation from the gross abuses of the bad corporations. But every one, if he is wise, will remember that great industrial abuses are no more easily cured than great physical and moral evils. Too abrupt cures are apt to mend the patient by killing him. A speedy dissolution of all the present bad corporations would, no matter how beneficial its final results, plunge the nation into financial and industrial chaos. And how unspeakable the situation, if the vicarious sufferings of the good corporations were allowed to go too far!

Of course it is the intention of no one to go so far as that. Even the bad corporations have, along with all their harm, done a vast amount of good; and the aim is, and should be, to eliminate their hurtful features without in the least impairing their efficiency for good. A moment's serious reflection will show that there could not be a more delicate problem than this. But impatience is not the best mood for serious reflection. Yet it is the mood on which the public mind is fast verging, if, indeed, it is not already there. Alexander the Great won an empire by cutting the Gordian knot with the sword. But the world has not many Alexanders. The success of bold, summary solutions of great vexatious problems depends a good deal on the nature of the problems. Some lend themselves easily to that treatment, while for others it simply makes the situation worse confounded. It is almost an

axiom that a rude hand should never be laid on the industry of a people. The mechanism is too delicate.

* * *

There is an old story of an Indian doctor who advertised that he could recover people from the cancer. It is recorded that he took a man so afflicted and bound him to a tree, and then burned him with red-hot irons until the tainted matter was eradicated. "There," he said, when the burning was completed, "I can't cure a cancer, but I can cure a burn." We suspect, however, that not all his patients came through the process alive. Nature works in more leisurely fashion, and it is conceivable that her way is best. If the mills of God grind slowly, they at least grind exceeding small, which is after all the main thing. There are no abuses harder to be borne than economic abuses. It is no wonder that the patience of mankind breaks down under them. But the breakdown of patience means hysteria, and hysteria in economic affairs is apt to mean prostration. When wine steps in the man steps out; when hysteria bursts in the door, wisdom flies out of the window.

The Two Stages of Public Utilities

Public service corporations must inevitably pass through two periods. The first is the period of creation, the second the period of co-ordination and adjustment.

In the case of innumerable corporations, the first period is closed. What has been done has been done, and the record must stand. Innumerable new corporations are yet to be created, and it is safe to assume that those who create them will profit by the experience of those who built up the existing corporations. But it is not of these that we desire to speak at this time. What concerns us now are the existing corporations. These have recently entered their second phase, and this second phase is the object of our study.

Say what one will about the ethics or the economics of the first period, there is no denying that it has been productive of marvellous results. If we assume that the existing corporations have not been created and developed with perfect regard to the laws of justice and sound business, we nevertheless cannot ignore the fact that they have contributed enormously to the comfort and

prosperity of the nation. Just at present the public are viewing their defects with microscopic eyes. It was inevitable that the public should reach this point. They are tolerant of an institution which claims to have a proper intent, so long as it is engaged in getting a foothold. But when once it has demonstrated its strength, they claim the right to subject it to criticism to see if it is properly fulfilling its mission. Public servce corporations cannot and do not expect to escape this fate. All they ask is that the criticism shall be both honest and intelligent.

Criticism does not mean fault-finding. It may or may not result in that, as the facts determine. A critic is one "versed in the art of weighing the merits" of a thing. To "weigh the merits" of public service corporations is not only a privilege of the public, but also a duty. The State grants the corporations the right to exist, and it is incumbent upon it to see that its creatures properly perform the tasks to which they have been appointed. The State is in the position of a parent to the corporations, and it is highly important that it should act as a wise parent. Its judgments should all be based upon patient investigation of conditions, and in no case should they spring from passion. Its aim should not be to punish, but to correct and encourage. That is the sole function of every kind of criticism, using that term in its scientific meaning.

During the first or creative period of corporations, criticism is usually dormant. At most, it is sporadic rather than general. The fact that it is now general is sufficient proof that the second period has been reached,—the period of co-ordination and adjustment. Let us consider for a moment what this means.

It is perfectly easy to see why criticism is not general during the creative period. During that period the State has but one motive; namely, to induce capital to flow into public utilities with the utmost freedom. It is careful to put no restraint upon it. All it thinks of is to get the public utilities necessary to its development as rapidly as possible. At this stage it is prepared to pay a high price. The industry of a State never has been and never will be built up on a preconceived, systematic plan. In its initial stage, and far beyond its initial stage, it is the product of the need of the moment. To satisfy the need of the moment, all sorts of bounties are offered to capital. Corporations are granted the most liberal charters, excessive capitalization is winked at, franchises are given away, high price for service is willingly paid. In short, incense is burned without stint on the altar of capital.

Capital, to change the figure, is wooed until it is caught and made to produce highly effective results, and then criticism begins. At the start, the services performed by public service corporations are not viewed as a birthright, as something which every individual has a right to on coming into the world. They are regarded as something to be prized, but also as something to be bought and paid for, as one buys clothes or pictures. That is the way a community looks at them before it has them. After it has acquired them and has enjoyed them for a few years, it takes quite another view. It then considers them almost as essential as air and sunshine, and is prone to murmur at their being treated as purely commercial factors.

Criticism, like everything else, is first tentative. It is not born full fledged, but it is the product of long years of thought and experience. It is only by such process that correct standards of judgment are reached in any department of thought or activity. It is in this way only that the public can build up a sound criticism of public service corporations. The task is a most difficult one,—far more difficult than may appear on the face. The State by its past treatment of the public service corporations has bred in them many things which it now finds objectionable. Yet it cannot eliminate these by a stroke of the pen. It cannot encourage capital to risk itself in doing a certain thing, and say when the thing is done, "This is all wrong, and you must take the consequences." That would be neither honest nor expedient.

It would be absurd to say that the American public service corporations have of themselves bred the conditions which so many people now consider objectionable. The public service corporations are the creatures, not the creators, of their times. They are what the ethical and industrial sense of the American people has made them. They are no better and no worse than their day and generation. Neither on moral nor on economic grounds can the public service corporations be regarded as objects of reprisal. From the point of view of morals, the public are as much to blame as the public service corporations. From the point of view of economics, the public must bear in mind that when Samson avenged himself on the Philistines he wrought his own destruction as well. The tie between the public service corporations and the State are too indissoluble to admit of harm to the one without injury to the other.

The old order is constantly changing, and new times breed

new conditions. The relations existing between the public service corporations and the State in the creative period of our public utilities were not of necessity permanent relations. capable of readjustment in the face of changed conditions. would be folly for the corporations to take refuge in abstractions. They may claim that the relations between themselves and the State have heretofore been based, with the implied consent of the State, upon cold, calculating commercialism, and that of right such should continue to be their basis. But the Anglo-Saxon mind does not reason in that way. What were once mere luxuries—to be paid for as luxuries—have practically acquired the character of necessaries of life. The community might conceivably have got along without gas, electric light and power, and steam and electric traction; but having once adjusted itself thoroughly to these utilities it cannot abandon them without disaster. Whatever the theory may be, the practical sense of the American people tells them that they have acquired a prescriptive right to the great public utilities.

The public service corporations recognize the soundness of this view. They clearly perceive the necessity of adjusting themselves to it. It is no new view to them. It is exactly the view which self-interest, to say nothing at all of public opinion, was bound to force upon them. The present agitation for a severer disciplining of public service corporations is no doubt hastening the process of readjustment, but haste is not always the best policy. What is needed is a safe adjustment rather than a quick one. It is to be hoped that the crudity which characterized the creative period of public utilities will not be duplicated by a crudity in the period of readjustment. For in that event, the last evil will vastly outweigh the first.

CIVIC FEDERATION ON MUNICIPAL OWNER-SHIP

The final report of the National Civic Federation Commission on Public Ownership and Operation has at last been given to the public, through the medium of advance newspaper abstracts. The three large volumes embodying the report, containing, it is said, no less than a million words, besides masses of tabulated statistical data, are at this writing still in the hands of the printers and unavailable. The abstracts and critical reviews furnished to the press, however, give a fair idea of the scope and meaning of the long awaited compilation.

The Commission was created two years ago by the Civic Federation, to investigate and report on the general subject of municipal ownership and operation of public utilities. Its activities have been directed by an Investigating Committeee, including in its membership many well known business men, educators and publicists. Among these are Melville E. Ingalls, Chairman of the Board of Directors of the Big Four Railroad; Dr. Albert Shaw, Editor of the Review of Reviews; Prof. E. W. Bemis, Superintendent of the Municipal Waterworks of Cleveland, Ohio; William J. Clark, of the General Electric Company; Prof. John R. Commons, of Wisconsin University; Charles L. Edgar, President of the Edison Electric and Illuminating Company of Boston; Prof. F. J. Goodnow, of Columbia University; Milo R. Maltbie, recently appointed a member of the Public Utilities Commission in New York; H. B. F. Macfarland, President of the Board of Commissions of the District of Columbia; Prof. Frank Parsons of Boston, President of the National Public Ownership League, and others, among them several representatives of organized labor. The Commission employed for its investigations technical experts, engineers, accountants and statisticians, who with members of the Commission, visited a large number of public and private enterprises in the United States and Great Britain.

It is now certain that the report must not be looked to for a complete or decisive conclusion on the subject under examination. At best it contains materials which, suitably treated and combined, may produce illumination. At first glance it may seem a matter of regret that the Commission was unable to resolve all doubts and contentions, but this it was never really reasonable to expect, and hope of such a result could not possibly have survived an exposition of the methods of research adopted. In the introduction to the review of the work of the Commission's experts, is the following under the head of "Impartiality":

"In order that the inquiry might be thoroughly impartial, it was the almost invariable rule, in the selection of experts, to allow, with regard to the four public utilities within the scope of the investigation, each of the two leading elements of the Committee, the 'pros' and the 'antis,' an expert of its own choice; and in the work of examing each plant, a representative of the one side worked with the expert of the other."

Doubtless for a Commission made up of "pros" and "antis" this represents a well balanced, as well as an inevitable, policy. But it is significant that even in the examination of specific data the conflict of preconceived opinion was never for a moment lost sight of.

Nor do the results of what was evidently a desperate attempt to reach final and practically unanimous conclusions, furnish any foundation for a wish that further effort had been expended to that end. "There are some general principles," says the report, "which we wish to present as practically the unanimous sentiment of the Committee"; and then follows several declarations of which the following is a sample:

"There are no particular reasons why the financial results from private or public operation should be different if the conditions are the same."

This, of course, could be agreed upon by everybody, because it is utterly devoid of meaning. The conditions never are and never could be the same. One could walk on water as easily as on land if the conditions were the same, but human knowledge would not be advanced by such a statement even if it were written on oak leaves as the official utterance of the most solemn midnight conference of owls. It is easy to reconstruct from the result the

method by which such a sentence was produced. The process is one of elimination. Imagine a long table with a secretary at one end and a goodly company of "pros" and "antis" seated along the sides. There is a common and praiseworthy desire to be unan-The secretary reads a proposed conclusion. It is significant, important, full of meaning. Debate ensues; becomes tiring, if not tiresome. Changes are rung, but unanimity still sulks in the distance. It becomes evident that not phraseology but sense causes the conflict. But agreement must be reached! If there cannot be unanimity as to sense, let there be unanimity as to no sense. Someone proposes a phrase which will suck the meaning out, leaving the "conclusion" harmless. The tired debaters seize upon the expedient eagerly and pass on. A few, perhaps, smile as they stoop to examine the next number. But there is practical unanimity.

A somewhat similar process undoubtedly produced the "conclusion" bearing most clearly upon the vital subject of the inquiry. The report says:

"We have come to the conclusion that municipal ownership of public utilities should not be extended to revenue-producing industries which do not involve the public health, the public safety, public transportation, or the permanent occupation of public streets or grounds, and that municipal ownership should not be undertaken solely for profit."

The last clause of this sentence has a real and important meaning and the fact that it escaped the eliminating process is exceedingly significant, but the rest, although on casual reading appearing to embody a profound utterance, is found, upon examination, to say almost nothing at all. The principal utilities involved in the general discussion of municipal ownership and operation are water works, car systems and electric and gas lighting enterprises. These all come under one of the headings as involving public health and safety, or transportation, or the use of public streets or grounds. By the form of the utterance the Committee excepts these from its "conclusion" and in effect earnestly assures the public that, having examined carefully the facts relating to water works, gas, electricity and street cars, it has come to the conclusion that municipal rabbit-warrens, golf links, potato patches, etc., (that is municipal enterprises not included in the exception) if revenue-producing and unconnected with health and safety, are undesirable. This is interesting, but not very important. How the "pros" and "antis" must have struggled over this deliverance, and how finally negatives were substituted for affirmatives in the search for unanimity, are all too clear.

While nothing in the "conclusions" reached upon the vital points at issue can be regarded as complete or decisive, some points upon which experienced students on both sides were already known to agree, are restated with a clearness which may be edifying to those who may be described as crude "pros" or crude "antis."

Thus it is agreed in the report that as the public utilities studied "are so constituted that it is impossible for them to be regulated by competition," they "must be controlled and regulated by the government," publicly operated, or "left to do as they please," the latter being a course advocated by no one. If properly read this will give pause to those who are advocating competitive municipal plants, as well as to public service corporation managers, if any there be still in darkness, who imagine that they are conducting purely private enterprises. A final statement in the summing up, that "public utilities, whether in public or private hands, are best conducted under a system of legalized and regulated monopoly" is perhaps the most definite and authoritative declaration of the report.

Again, the report voices the enlightened demands that a competent public authority should have power to require for all public utilities a uniform system of records and accounts, that each city operating public utilities should separate the finances of these undertakings from the general fund accounts, that political influence and personal favoritism should be excluded under such circumstances, etc.

It is likewise significant that the "pros" were not unwilling to include in the report some very plain talk addressed to the less discriminating adherents of their favorite doctrine. The agreement that "municipal operation should not be undertaken solely for profit" has already been alluded to. This sounds like a not surprising warning that too much should not be hoped from this frequently exploited feature.

On the capacity of cities to operate utilities the tone of admonition is even more distinct. The report says:

"We wish to bring to your consideration the danger here in the United States of turning over these public utilities to the present government of some of our cities. . . . There seems to be an idea with many people that the mere taking by the city of all its public utilities for municipal operation will at once result in ideal municipal government through the necessity of putting honest and competent citizens in charge. While an increase in the number and importance of municipal functions may have a tendency to induce men of a higher type to become public officials, we do not believe that this of itself will accomplish municipal reform. We are unable to recommend municipal ownership as a political panacea."

This is the pricking of a favorite and attractive bubble, for which the Commission is entitled to credit and praise. The slippery eels of the municipal ownership debates have been those who, admitting that profits from municipal enterprises may often be wanting, and that service may often be inferior, have nevertheless declared that municipalization should go forward, as a feeder to the "higher civic life" of the community. It is a comfort to have these fellows finally landed in the basket, with the lid securely on.

That the Commission has thus failed, except incidentally, to reach general conclusions of importance and value, must not be taken to mean that its two years of labor have gone for naught. Far from it. Data of inestimable value have unquestionably been secured, and it makes very little difference, so long as substantial accuracy has been insisted upon, what immediate effect these data have produced upon the minds of the Commission's critical (and already convinced) reviewers.

The full benefit of the work will not be felt until long after the three volumes, with their million of words and their tabulated expanses, have been distributed and digested, not by "pros" and "antis" but by mayors, councilmen, legislators, governors, public spirited citizens and leaders of public thought. It is to be feared that the vast extent of the production will delay this salutary process. While some earnest students who have mourned the scarcity of reliable information regarding municipal ownership may welcome the full report, as the poor old lady who had lived all her meagre life in a crowded tenement welcomed a sight of the ocean, exclaiming "I am glad for once in my life to see something there was enough of"; a majority probably will say of the report, as Macaulay said of Dr. Nares's memoirs of Lord Burleigh, that it might have been considered as light reading by Hilpa and Shalum,

but unhappily the life of man is now three score years and ten and it is unfair of the Civic Federation to demand so large a portion of so short an existence. Nevertheless the report will be welcome when it emerges from the bindery, and will be digested—in time.

Besides the summing up, the Commission has issued to the press some advance abstracts of critical reviews of the reports of the bi-partisan experts, which call for brief comment, though a sight of the reports themselves would be more welcome. Following its policy of balancing, the Commission appointed four persons, "two on a side," to review critically the results of the inquiry in the United States. Two of these, Mr. Walton Clark, Vice-President of the United Gas Improvement Company of Philadelphia, and Mr. Charles L. Edgar of Boston, President of the Edison Electric and Illuminating Company, severely criticise the municipal plants examined; while Prof. Frank Parsons of Boston, President of the National Public Ownership League and Prof. Edward W. Bemis, another active advocate of municipalization, praise the municipal plants at the expense of private operations.

Obviously these "reviews" are intended to offset each other, and so far as one may judge from the abstracts, they are, in this, quite successful. Both "sides" perform their functions with vigor and the contradictions are full and complete. It is interesting to note, however, that by the shock of the onslaught, Prof. Parsons and his associate were at the very beginning forced to fall back upon the old entrenchments, declaring that in most discussions of the municipal ownership problem "too much attention is given to the purely financial side of the question." "Dollars and cents are not to be neglected," says Prof. Parsons, "but life, liberty, justice, virtue and intelligence—the whole character product and social product of our institutions—are of greater moment than their money product." Thus one particularly slippery eel manages to slide out of the basket. Perhaps this was written before he was landed; that is, before he signed the report in which municipalization as a process of civic reform is distinctly and decisively refused endorsement.

Equally interesting and significant is Prof. Parson's defense, a part of this review, of the failure of municipal ownership in Philadelphia. Philadelphia never had real public ownership, he says because while the municipality owned the gas works, the politicians owned the municipality. Doubtless this is true, but in stating it Prof. Parsons no less certainly begs the whole question.

The evils of political influences under municipal ownership, and works in Philadelphia did not promote liberty and justice and virtue, which he says are sure to follow in the wake of extended municipal enterprises.

Other critical reviews made public are by Mr. William J. Clark and Prof. Parsons on the expert examination of British tramways; Mr. Milo R. Maltbie, Mr. Walton Clark and Mr. Charles L. Edgar on British municipal enterprises other than tramways; Prof. John R. Common and Mr. J. W. Sullivan, of New York, Editor of the Clothing Trades Bulletin, on labor conditions as related to municipalization; and Prof. Frank J. Goodnow and Mr. Walter L. Fisher, President of the Municipal Voters League of Chicago, on political conditions in the cities of the United States and Great Britain as they bear upon the question of municipal ownership.

Space does not permit extended treatment of these articles, all of which are prepared on the bi-partisan plan and all of which contain indirectly much that is instructive and useful. It is interesting, for instance, to note that when Mr. Clark asserts that the service of the British municipal tramways is inferior to the average street car service in the United States conducted by private enterprise, Prof. Parsons's best answer is that conditions here and abroad are essentially different. But it is impossible to pursue at length these comparisons, however instructive they may be

It is necessary to conclude, with brief comment upon a quotation from the review of Prof. John R. Common who writes (on the municipal ownership "side") in relation to labor and politics as affecting municipal enterprises. His view is that under public ownership and operation the recognition of labor organizations would prove a safe-guard. Without stopping to comment on that, the quotation, which is intended as a defense of the charge that there is too much "politics" in the municipal gas enterprise of Wheeling, West Virginia, is appended:

"The secretary of the Wheeling Gas Trustees, quoted by my colleague as testifying to the political rottenness of the municipal gas works, is the same man who testified to the political rottenthe power municipal ownership gives the politicians, constitute one of the chief reasons why the extension of municipal activities is viewed with alarm by conservative men. And besides, Prof. Parsons does not explain why the public ownership of the gas ness of the private gas, electricity and street car companies of that

locality. Instead of relying upon his statements, I interviewed a large number of officials, politicians, business men, employees and others, and checked his statements respecting both the gas works and the corporations. This shows that while the gas works are in politics, the public-service corporations are also in politics. The gas employees take part in the primaries of the Republican party and the motormen and conductors of the street car companies are given leave of absence on pay to work in the primaries of both the Republican and Democratic parties. Even the officers of the street railway employees' union take part in this kind of traction politics on behalf of their employees. The councilmen and aldermen nominated and elected in this way control the municipal gas works and they control the franchises and contracts of the private companies. The 'City Hall Ring' is just as much a ring of the political tools of the private corporations as it is the ring of municipal politicians. To pick out the politics of the gas works and not to see that it is bound up with the politics of the private corporations would be a perverse and one-sided method of investigation. The report gives no selected facts, but all of the facts in the situation. Indeed, the secretary of the Wheeling Gas Trustees, in his indignation toward the political management of the gas works, referred to by my colleague, was defeated in the Republican primaries by the motormen and conductors of the street car company on leave of absence as political workers."

Doubtless this is a valid tu quoque. But does not Prof. Common inadvertently prove too much? Is his description of conditions at Wheeling likely to inspire such enthusiasm as will lead to the extension of public activities in other municipalities where exactly the same conditions obtain or may be induced? The warning in the official summing up of the Commission is recalled. The people, it says, "must also remember that municipal ownership will create a large class of employees who may have more or less political influence." In the light of Prof. Common's description of conditions at Wheeling, this admonition, in its very mildness, has an ominous sound.

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STONE & WEBSTER'S LABORATORY

BY L. B. BUCHANAN

Shortly after beginning business under the name of the Massachusetts Electrical Engineering Company, Stone & Webster established a laboratory.

Up to about 1894, the work done was almost exclusively electrical, and consisted for the most part of electrical testing for clients at large, and in connection with the engineering work then in progress, managed by the firm. During this period some experimental work was done which brought forth a line of electrical instruments, of which the chief one was a galvanometer designed by Professor Holman, which proved to be, at that time, a very successful instrument. With the advent of the D'Arsonval galvanometer and owing to the fact that the Thompson galvanometers, of which the one mentioned was a modification, were extremely sensitive to jars and extraneous electrical disturbances, the demand for such an instrument became extremely limited and its manufacture was discontinued. There was also brought out an electric switch for street car lines, which has not been actively followed up, but whose principles are in practical use today in the switches manufactured by other parties licensed under the original patents. Work in the interest of clients brought forth many successful devices and materials, principal among which were the Shawmut tested fuse wire and fuse links, whose reputation and use at the present time is extensive, and several of the insulating compounds of the Massachusetts Chemical Company.

The chief work of the laboratory was all the testing of electrical materials for the Underwriters' Union. Standard tests

were evolved for switches, cutouts, fuses, insulating joints, paints, porcelain fittings, lamps, meters, and in fact everything that was mentioned in the Underwriters' book of rules. When the Underwriters established their own laboratories, somewhere about 1895, the Stone & Webster laboratory gave up to a great extent commercial testing and simply carried on such work as was required in connection with the engineering of the firm, which had then grown to large proportions. Complete installation tests were made at the Bradford Power Station, the Exchange Club, Boston Fire Headquarters, Dedham Court House, Brockton Power Station, S. D. Warren & Company's Plant, New Hampshire State Library, Suncook Mills, Newton Pumping Station, the State House, Morse Twist Drill Company, Westboro Insane Hospital and Quincy Market Cold Storage Plant, and at many other places of less importance. Calibration of instruments, adjusting of wattmeters, trouble hunting on generators, motors, and cable installations, kept several men busy. The investigations of electrolysis of the water pipes in Boston and Newton, Mass., and Peoria, Ill., were works of considerable magnitude. The first work of this kind was done in this city, and Mr. Robinson and the writer can undoubtedly lay just claim to being the original electrolytic fishermen, who, armed with jointed bamboo poles fitted with reel and wire, operated in the hydrants and track-bounded mud puddles of Boston, instead of "mother's pail," as related in the well-known nursery rhyme.

The instruments available twelve years ago for work of the kind described in the foregoing paragraphs were with few exceptions crude compared with those of the present day. Measurements of energy in alternating circuits were made with some misgivings on the part of the operator, for no one was entirely sure that the indications were truthful records of the actual energy, particularly when two or three phase current was used. Many indirect methods, such as those based on the calorimeter and hot wire voltmeter, were resorted to, to check results, and were often productive of a frame of mind in the operator which was comparable with that coincident with testing underground cables with a Thompson galvanometer in the Back Bay, between an electric car track and a road building establishment, the delights of which latter performance at least one of our engineers has not forgotten.

In 1896 the electrical laboratory was discontinued as a distinct department, but shortly afterward a chemical laboratory was equipped, some of the men of the old testing department were

transferred to the new field, and some of the results of the work therein undertaken are the subject of another article.

The following college and technical school men have been connected with the laboratory at some time in its history:

Charles A. Stone, M. I. T.

Edwin S. Webster, M. I. T.

Russell Robb, M. I. T.

Henry G. Bradlee, M. I. T.

Hollis French, M. I. T.

Francis R. Hart, M. I. T.

Laurence J. Webster, M. I. T.

James W. Cartwright, M. I. T.

Ralph Vose, M. I. T.

T. Whitney Blake, Yale.

Howard L. Rogers, M. I. T.

Howard C. Forbes, M. I. T.

Charles F. Wallace, M. I. T.

Dwight P. Robinson, M. I. T. and Harvard.

Charles Garrison, M. I. T. and Harvard.

Leonard B. Buchanan, M. I. T.

John W. Soars, W. P. I.

Fred'k S. Pratt, Harvard.

Howard S. Reynolds, M. I. T.

Dr. T. A. Mighill, Amherst & Gottingen.

James M. Mackaye, Harvard.

Benj. K. Hough, Cornell.

Franklin N. Conant, M. I. T.

Charles E. Baldwin, Harvard.

S. Everard Williams, Harvard.

R. O. Dalton, Harvard.

Karl Burroughs, M. I. T.

Austin T. Hyde, M. I. T.

W. H. Whitcomb, M. I. T.

R. A. Witherspoon, Rochester University.

STONE AND WEBSTER IN THE FIELD OF ELECTRO CHEMISTRY

BY L. B. BUCHANAN.

Knowledge of electro chemistry may be considered to have begun with Galvani and Volta. Davy, Faraday and Bunsen gave the subject a great deal of attention, and it has subsequently received careful consideration and material advancement at the hands of the great physicists of the last fifty years. While in some directions practical development followed fairly rapidly the results achieved in the research laboratory,—notably in primary batteries and electroplating,—application to the production of chemicals on more than a laboratory scale proceeded slowly and did not attain any magnitude until the dynamo became the well established primary source of electric energy.

Nevertheless, it cannot be said to be the fault of the chemical engineers, because as early as in 1853, or thereabouts, Charles Watt patented in England electrolytic methods for production of chlorine and soda, chlorates, etc., and other kindred methods that completely anticipated the basic principles of many of those which did not come into use until forty years or more later. To a certain extent Watt may be said to have had a lot of "paper patents," but if he had also had a full sized dynamo driven by a Puyallup or an Androscoggin, and had done exactly what he described in his patents, he would have been able to make the products he claimed at figures that would have troubled the old line manufacturing chemists not a little.

The decomposition of common salt for the production of chlorine and bleaching powder, together with caustic soda, attracted the early attention of the latter-day electro chemists, and without intending any injustice to others who may have entered the practical field earlier than those who will be mentioned here, it may be said that Messrs. S. D. Warren & Company, whose early electrical transmission plant was a subject of Mr. Robb's interesting article in the July issue, were likewise up-to-date and progressive in their chemical department, and after experimenting for a time with the Hermite hypochlorite process (an electrolytic process developed a short time previously in Europe) they undertook the practical development of a salt decomposition cell, with the assistance of Professor Henry Carmichael of Boston. They were successful and have long used the process at their mill at Cumberland Mills, Maine.

As long ago as in 1893, Messrs. Stone & Webster were employed to test and report on the efficiency of this process; but with the exception of occasional work for that firm, they did not devote themselves particularly to electro chemical work until 1896, when the Jacques Carbon Electric Generator was brought out.

As engineers for those interested, it did not take them long to demonstrate the failure of the Jacques potash pot as a primary source of electricity by the use of coal, and to sound the knell of that interesting and deceptive *ignis fatuus*. With a laboratory well equipped it was in order for the firm to continue research along chemical lines, and after devoting some attention to the utilization of ozone and a glass diaphram chlorine cell, the problem of producing chlorates was taken up in 1898, with the result that in the fall of 1899 a plant capable of making one ton of chlorate of potash per day was built at Rumford Falls, Maine.

After experiencing the difficulties incident to the establishment of a totally new business, the plant was enlarged in 1901 and 1902, and by virtue of improvement in efficiency is now able to turn out more than two tons per day, which finds a ready market in this country; and it is safe to say that many of the employees of Stone & Webster are wearing fast black cotton apparel, are lighting their cigars with snap matches, and have celebrated the nation's birthday with fireworks,—all of which articles used some of the chlorate of potash made by the Fort Hill Chemical Company. Its usefulness in each case was due to the three atoms of oxygen which the Androscoggin River by the force of its long fall at Rumford, acting through the medium of the electric current, wrested from a portion of itself and combined with each molecule of muriate of potash brought from Stassfurt, Germany, to make the molecules of chlorate, which after crystallization, the same great power washed, dried and ground.

The plant of the Fort Hill Chemical Company operates two 39 inch (twin) Rodney-Hunt wheels on 50 feet head, governed by a Lombard. The electrical equipment consists of four 140 K. W. 140 volt belted Crocker-Wheeler generators specially wound for electrolytic work. These machines run at full load twenty-four hours each day, seven days in the week. While the output of the plant is considerable, being approximately one-sixth of the total consumption of chlorate in the United States, the number of employees is small, as is usually the case where electricity does the work.

Following the development of the so-called wet bath processes such as those mentioned previously, came the fused bath and electric furnace methods. To a modest French citizen who very recently died while yet a young man, the world owes more than can be measured by mere figures following a dollar sign. Henri Moissan, chemist, physicist, savant and humanitarian, by his tireless research work, observing and noting the details of his experiments with a care that equalled, if not exceeded, that of that earlier natural philosopher, Count Rumford, has left a paved way with many friendly guide-boards which will be ever travelled by lesser lights of high temperature research, and will lead toward the goal of advanced civilization.

Stone & Webster first became interested in electric furnace work in 1899, when the inventions of the Ampere Electrochemical Company, consisting of several furnace processes, which were in the laboratory stage, were brought to their attention. Among these was one which covered the manufacture of artificial emery or alundum from bauxite. This was taken over by the firm and was commercially developed at the works of the Fort Hill Chemical Company at Rumford Falls. The value of the process was at once recognized by the Norton Company of Worcester. They became the sole licensees under the patents which are now owned by the General Electrochemical Company, and at present operate a large plant at Niagara Falls, making all the abrasive material used in the manufacture of their grinding wheels, which have a world-wide reputation.

There is at present maintained by Stone & Webster a research laboratory which is continuously employed in investigating new chemical processes, and while quite a few have been brought to a point beyond which operations on a laboratory scale will yield no

further result, none beside those herein mentioned have been actually launched as commercial enterprises.

While their success in this line is not so generally known as is their success and consequent prestige in the great field of public service enterprise, it is nevertheless a fact that the hand of Stone & Webster has been felt in the arena of chemical industry, and their two successful companies bear witness thereto.

THE NEW STONE & WEBSTER BUILDING

Owing to the necessity for increased floor space for Stone & Webster and for the Stone & Webster Engineering Corporation, the Engineering Corporation recently purchased a modern, eight story fireproof office building in Boston at No. 147 Milk Street, the corner of Batterymarch.

The four lower floors of the building will be occupied by Stone & Webster as soon as it is possible to make the necessary alterations.

The Engineering Corporation have occupied, since August 19, the fifth, sixth, seventh and eighth floors of the building as follows:

The Executive Offices, the Construction Department and the Accounting Department, with the necessary stenographers, and the Directors' Room on the fifth floor.

The Engineering Department, exclusive of the Drafting Room, will occupy the entire sixth floor, with its own corps of stenographers.

The seventh floor will be partially occupied by the Purchasing Department with its stenographers, the Mailing Department and the blue print room of the Drafting Department, leaving about one-third of the space on this floor for future growth.

The eighth and top floor will be occupied by the Drafting Department, proper space being left for filing of blue prints.

In making this move from its old quarters, on the ninth floor of No. 84 State street, to the new building, the Engineering Corporation has nearly double the actual floor area it had before besides having some space for future growth, and will be greatly benefited by the change.

A very good idea of the new building may be had from the half-tone print on the opposite page and from the typical floor plan on the page following.



STREET

BATTERYMARCH

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METHOD OF REDUCING COST OF ACCIDENTS

BY EDWARD T. MOORE.

It is the theory of the law in Texas, as elsewhere, that in every case the plaintiff must establish his right to recover against the defendant by a fair preponderance of evidence. In practice, however, when the plaintiff sues a corporation for personal injuries the rule is reversed and strengthened, so that the defendant in such a case is required to prove, beyond a reasonable doubt, a want of negligence. Since we confront this condition as a practical matter, it is very essential in the operation of street railroad systems, that every possible means be used, first, to prevent accidents, and second, when they do happen, as they will, that they be handled promptly and with intelligence, so that when we are brought into court in a personal injury suit the same may be successfully defended.

In order to make a thorough investigation of any claim growing out of an accident, it is very necessary that trainmen get all the information possible at the time the accident happens and promptly furnish same to the Claim Department. It has always been a problem with us to get trainmen to thoroughly appreciate the importance of giving a full and complete report of accidents happening on or about their cars, and a failure on their part to do so has hampered the Claim Department, more or less, in the handling of claims. Even some of our best men seem to take it for granted that they have done their full duty, when reporting accidents, if they secure the names of a few passengers, no matter how many they have on their car; while in many instances they fail to report accidents which they do not deem of sufficient importance to require a report.

With a view of reducing the number of accidents and getting a full and complete report of all accidents happening on our system, no matter how trivial they may seem to the trainmen, a series of lectures were given during the month of June. The men were met in shifts, depending on their hours of labor, and it was arranged to meet each shift twice a week. In order to aid the men to follow what was being said, and also to assist them in remembering what had been said to them, these lectures were printed and a copy put in the hands of each man at the time the lectures were given.

At the beginning of these lectures all motormen and conductors were invited to write papers on the topic "How to Prevent Accidents" from their respective standpoints. A standard uniform was offered to the motorman and to the conductor who should write the best paper. The award was to be based solely on the value of the suggestions made, without regard to penmanship or composition. These papers were all to be handed in not later than June 30, which was the end of the course of lectures. Trainmen were urged to attend all lectures, not only for the benefits to be derived from the discussion of this subject at the several meetings, but also that they might gather information for their papers. The subjects of the lectures were as follows:

- 1. The Prevention of Accidents.
- 2. The Purpose and Necessity of Reporting Accidents.
- 3. What to Report as Accidents.
- 4. Handling Accidents at the Time They Happen.
- Witnesses.

The lectures were opened with a talk by the Manager, in which he complimented the trainmen by saying he believed that Dallas had a higher class of trainmen, as individuals and as citizens, than most of the cities in the United States, but he called their attention to the number of accidents we were having and to what the accidents were costing the Dallas Companies in dollars and cents, pointing out to them the necessity of making an improvement in this matter, and urging their co-operation to the end that Dallas should make the best record of any company in the state.

Following the Manager, the subject was next taken up by Mr. Emerson, Superintendent of Railways, who discussed matters of operation, calling attention to certain rules and the violations thereof, which tended to increase the number of accidents, after which Mr. Walne, Claim Agent, discussed accident reports and the necessity of getting a full and complete report in every instance.

Five lectures, in all, were given. It was thought best to have the attendance at the meetings voluntary, and it was very gratifying to see that the majority of the men took advantage of the opportunity and attended regularly. A few did not attend any of the meetings, and others were more or less irregular. As a result of the work, however, we succeeded in reaching most of the men in our employ through this course of lectures. Papers were also received from more than one-half of the trainmen, and most of the letters showed a great deal of thoughtful study and keen interest in the subject. While we did not receive letters from all of the trainmen, our investigation of the matter shows that most of them at least gave the subject considerable study Many of them prepared letters, but did not send them in, for various reasons.

A committee composed of the Manager, Superintendent and Claim Agent read all the letters carefully, many of which possessed so much merit that it was with some difficulty that they were able to agree upon who were entitled to the prizes; in fact, the contest was so close that it was found advisable to award four uniforms instead of two. This seemed to have a good effect upon the trainmen, generally.

We feel thoroughly satisfied with our experiment. We do not believe it possible, with the amount of time and money expended, in any other way to induce so much individual thought on this subject, as we seem to have thoroughly aroused the interest of the men in this branch of their work. We propose to continue this character of instruction and give the trainmen every possible assistance, eventually weeding out careless and indifferent employees.

A SOUTHERN GAS COMPANY

BY MAC D. DEXTER.

The Stone & Webster interests in Columbus comprise the Columbus Railroad Company, The Columbus Power Company and the Gas Light Company of Columbus.

The latter company was taken over in 1903, and since then has nearly doubled its output of gas. During the ten years previous to 1903 the output had only increased 10 per cent. The gas plant was built by Perdicaris & Hoy in the year of 1852. The son of the senior member of the firm achieved some notoriety by having been captured by brigands in Morocco a year or two ago, and some stock was held by the Perdicaris estate until the transfer in 1903. In early days gas was made from fat lightwood and rosin. One of the old cast iron rosin retorts can be seen at the plant today, where it is humbly serving as a post to prevent teams from driving against one of the holders.

In the early days only the better class of residences and stores used gas, which with street lighting was the sole business of the company. Gas for fuel was unknown, and even after the company made gas from coal all the tar was allowed to flow into the river as waste product, and even coke was considered a drug on the market. It seems that during the war the plant was kept running until it was burned by Wilson's raiders in 1865. However, shortly after this the works were rebuilt and prospered, the price of gas being \$8 per thousand feet at that time.

Among some of the old papers was found an interesting relic of war times in the shape of a day book, from which one would judge that a small iron foundry was run in connection with the gas works. The entries show that money as a means of carrying on trade was almost unknown during the latter part of the war. In August, 1864, John McIlhenny was debited with 23 pounds of ham at \$3 per pound. Just below that entry was

Foundry Acct.	Dr.
1-2 gal. oil	\$13.00
1 1-2 lbs. nails	5.00
and then	
B. Williams,	Dr.
One 14 in. sugar mill delivered this day	\$1,125.0 0
B. Williams,	Cr.
By 176 lbs. bacon sides	
By 194 lbs. lard	\$1,107.50
By cash	17.50
Total	\$1,125.00

Coal was \$150 per ton and iron was \$350 per ton. After the war was over the progress of the Gas Company was slow but steady, and in common with most other companies it lost some business, including street lighting, when electricity came into the field. Gas for cooking had been pushed prior to 1903, but the first year Stone & Webster had charge the number of new customers obtained was four times as many as the year previous, a full car load of stoves being sold that year. Last year, three years later, three car loads were disposed of. Prior to 1903 it took 10 years to gain 10 per cent., now each year shows 30 per cent. gain in output.

Columbus is largely a manufacturing city, and especial efforts are being made to introduce gas to the artisan and cotton mill operatives. This class in the South is a little slow in taking to things new to them, but surely as they are being educated to riding on the street cars they will take the gas to save them work, worry, time and heat.

Cheap pine wood fuel and the negro servant in times past have been the greatest drawback to the general adoption of gas for cooking. Cooking with gas is now taught in public schools, both colored and white. The demand for servants is greater than the willing supply and the price of wood is going steadily upward.

The prepayment gas meter is proving to be a great help in getting new business. Already one-third of the meters in service are of this character. With this meter the wage earner buys gas by the quarters' worth at a time. The Gas Company gets cash without the necessity of making out a gas bill, and the customer

sees and feels that he gets value for his money. The housekeeper with a negro cook uses the prepayment meter to keep check on the servant to prevent waste.

To show the growing business, in 1902 an extension of the mains was made to Rose Hill, with a branch to East Highlands. Four years later, although favorably situated at an elevation of one hundred feet above the gas plant, where the pressure is higher, due to the natural tendency of gas to rise, the mains were so overtaxed that an auxiliary supply line was necessary. This pipe was laid in the fall of 1906 and also an extension made to one of the mill settlements just established, known as Jordan City. Here gas is used for singeing cotton goods in one of the mills, for embossing in a chair factory, and in the operatives houses for cooking purposes.

So far as is known, this is one of the first extensions in the South to a strictly cotton mill district. Another extension was completed early this year to the suburb known as Wynnton, and the majority of the residents became customers at once.

The district at present supplied by the Gas Company comprises the old city, Rose Hill, Wynnton, and a part of East Highlands, the field of Bibb City to the North and Girard and Phenix City in Alabama being still unsupplied. A plan is being considered to reach these districts, together with the growing settlements made possible by the improved street car facilities, which will still further increase the sale of gas.

While the sales of gas per mile of main in the older parts of town are not up to the standard of some other cities, at the present rate of increase Columbus will soon equal or surpass any other city of its size in the South.

THE BLUE HILL STREET RAILWAY COM-PANY DESPATCHER SYSTEM

BY A. H. WALCOTT.

The general direction of our line is north and south, and our despatcher is provided with a despatching sheet, which is fastened to a table to show the car movements north and south and cars working towards each other.

On this sheet is given the distance between turnouts and crossovers, also the running time between turnouts and crossovers, with spaces to be filled out with the car crews, car numbers, time cars leave, delays in leaving, exact time of leaving and the time that the car arrives at each meeting point or calling up point, the time that cars are due to arrive at their terminals, the time they arrive, and delays if any.

If more than one car is run in one section, the number of extra cars is set down in the upper right or left hand corner of the space, as the case may be, to indicate whether extra cars are ahead or behind the regular. When plows are run in the same section with regular car, the letter "P" is used; for service cars, the letter "S." This indicates at all times just how many cars or plows there are in a section and whether they are ahead or behind the regular car.

The sheet also provides for taking the temperature each hour, and what sign is displayed to indicate the point of heat required. Condition of the weather and rail is given every six hours, with the name of the despatcher and the time he comes on and goes off duty.

Spaces are also provided for delays, and remarks in general, so that at the end of the day's run we have a complete record of all car movements during the day.

At all turnouts and intersecting lines and crossovers are placed telephones of Couch & Seeley pattern, and all employees are provided with keys. Before leaving terminal points, the conductor calls up the despatcher, giving his name and the name of his motorman, number of the car, number of the telephone at which he is, and his route and destination. The despatcher then gives him his orders, which the conductor repeats back to the despatcher, word for word, and if correct despatcher answers O. K. If not correct, the despatcher so states and proceeds to give orders again. Upon receiving the despatcher's O. K. conductor repeats orders to motorman, who repeats them back to conductor and receives his O. K., the motorman not being allowed to start his car until he has received O. K. from the conductor. The same rule applying to all points along the line.

Employees calling up are required to take down the receiver and listen, and if the line is not clear wait until it is so before calling, except in case of emergency, when they may call despatcher, calling for a clearance on the line, stating an emergency case.

We are experimenting with double telephones. We are connecting to our 'phones hand micro telephones, and under this system the conductor and the motorman both proceed to the telephone, the conductor calling up the despatcher and upon receiving notice that his call is answered he proceeds in the usual manner, the motorman listening through his own receiver. When the conductor has repeated his orders back to the despatcher and received his O. K., the motorman then repeats orders, as he has received them, to despatcher. If correct, he is answered by despatcher as complete. In this way there should be no misunderstanding of orders, as both conductor and motorman have received the orders from the despatcher and repeated them back to him and received his approval.

All turnouts, crossovers and junction points are numbered to correspond with the telephone number.

To protect our employees against shocks in using telephones, we have placed at all pole boxes a platform made of 2-in. planks cleated together. Four (4) pole pins are placed near each corner and on these pins are screwed the ordinary glass insulators. These platforms are set with the insulators on the ground and have proved a great safeguard against shocks.

In addition to our despatcher system we also have all of the single track portion of our main line, and also the section on the Norwood division from the car house to the main line, equipped with automatic block signals. We have thirteen blocks now in use

on the line, a large part of which have been in operation over three years.

These signals are especially designed for use on single track trolley roads, to govern traffic in both directions. They are entirely automatic in operation, being controlled in their action by the trolley wheels of cars acting on contact devices secured to trolley wire.

Two trolley switches and two signal boxes are required for a set or block of signals, and this apparatus serves to govern traffic on a section of track between any two predetermined points, such as two adjacent turnouts or intersecting lines. The two signal boxes at opposite ends of a section are connected by two line wires, and for this purpose we have used No. 10 galvanized iron wire.

The usual signal is a metal target about 8 in. in diameter and painted red. This target is placed underneath the signal case, and so is completely protected from the weather. Two 5-in. semaphore lenses, one red and the other green, serve as auxiliary and night signals. There is an ordinary 16 c. p. lamp back of each lens, and the lamps at each signal box are in local circuits and not connected with any of the rest of operating circuits, so that the burning out of lamps does not affect operation of signal.

These signals are made so as to allow several cars, travelling of course in the same direction, in a section at the same time, and each car before it enters gets a positive signal.

The signals are given to motormen as follows:

The normal position is with the red target displayed and neither lamp lighted, indicating no car in the section going in either drection.

The red target displayed and the red lamp lighted indicate that a car is approaching from other end of section.

As a car, in entering an unoccupied section, passes trolley switch, the red target turns so as to present its edge, the red lamp lights for a few seconds, then goes out, and the green lamp lights. This gives a car the right to enter and proceed through section.

A second car following first car into the section sees the target edge on and green lamp lighted, this notifying that a car precedes it in section and so serving as a protection against a rear end collision. As it passes trolley switch the green lamp goes out and the red lamp lights up for a few seconds and then goes out and the green lamp lights again. This change gives the car the right to go ahead through section.

When a number of cars have so entered a section, the same number must pass out at other end of section before signals will return to normal positions again.

When several cars are in a section, if car leaves at leaving end at the same time another car enters at entering end, the mechanism will operate correctly. If cars try to enter opposite ends of an unoccupied section simultaneously, signals will clear at one end to allow one car to enter and go to danger at other end, thus "blocking" that car from entering.

When signal has been set to allow passage of car or cars in one direction through section, the mechanism is locked at entering end and circuits broken in signal boxes at both ends of section to prevent any interference with or change of signals so set until the last car leaves section, when they return to normal.

These signals have been generally satisfactory, although we have had some trouble with them. Some of this was at first doubtless due to our not understanding them and the proper way to take care of them. We also have had considerable trouble due to lightning burning out resistance units. This has been largely overcome by placing lightning arresters near each signal box and using a special lightning protection device furnished by the Electric Railway Signal Company and also by using a different type of resistance and placing same in wooden boxes separate from rest of mechanism and fusing line wires. Apart from minor things the balance of troubles have been caused by the trolley switch. This switch is provided with two contacts and so constructed that a trolley wheel of a car passing in one direction will close one of these contacts and wheel passing in other direction will close other contact. closure of these circuits so made is prolonged after the trolley wheel disengages switch by the action of an air dash-pot in switch.

The presence of dust or dirt in the valve of dash-pot at times prevents the prolonging of contact sufficiently to operate signal mechanism. We are replacing these dash-pots by an escapement device furnished by the signal company, and find that this practically eliminates trouble from this source.

We are also, with good results, removing the target and replacing it with a 12-in. semaphore arm. This arm stands normally in a horizontal position and is moved, when a car passes trolley switch in entering a section, about 70 degrees towards a vertical position.

Where the target is used it turns edge on so as not to be visible to a motorman when signal clears to allow car to enter block, but the new arm is always in plain sight and the motorman must see it in its lowered position before proceeding. By the use of this arm, the wear on the mechanism is much less than when the turning target is used, as it works much more freely.

The despatcher in giving orders instructs the crews to proceed with right of way signals to point designated. In this way if any misunderstanding should occur they would be held up by signals, when the crew would call up despatcher for orders.

STONE & WEBSTER IN THE TROPICS

BY F. J. HOVEY.

With the establishment by Congress of Civil Government in Porto Rico came a demand for modern facilities in the way of electric lighting and transportation.

At this time there were in the Island, at San Juan and Ponce, steam dummy lines which were operated under franchises from the old Spanish Government and which were obsolete and unsatisfactory. In both of these cities, as also in Mayaguez, there were lighting companies with machinery and equipment of old type, and, in the last named city, a horse railroad of antiquated pattern.

The first electrification of street railways was by J. G. White & Company, in San Juan, utilizing the old steam dummy tracks between the city proper and the suburb of San Turce.

A lighting system was also constructed and has since been consolidated with the native plant. Railway extensions are being made to Caguas, a distance of 22 miles. A water power on the Comerio River is being developed, and will be brought into the city over a transmission line, about 20 miles in length.

In 1901 Stone & Webster became interested in the building of a street railway and lighting plant in Ponce, the second city in the island, of about 35,000 inhabitants, lying three and a half miles back from the Playa, or Port, this site having been, it is said, selected by the founders of the city that the merchants might have their homes at some distance from the shore and be secure from the visits of pirates, who, at that time, infested the Caribbean Sea.

The entire wholesale business is done at the Playa, and all storage and shipping warehouses are situated there.

The main road, connecting the city and the port, presents a busy scene, a constant stream of traffic flowing in both directions. A street railway was therefore built to connect the city with the port, and a loop constructed within the city limits, skirting the two

principal squares and passing the Casino, the post office and other important points. The opening of this road was the signal for the abandonment of the old cab system, which was totally inadequate to handle the traffic, and passengers are now carried with ease and comfort at less than half the former price in about one-third of the time.

Shortly after the road was opened there was a period of depression in the sugar industry from low prices prevailing, and the coffee crop was also difficult to dispose of, owing to very high rates of duty imposed by foreign countries after the American occupation. For several years past these conditions have materially improved and are reflected in the amount of business done by merchants, shippers, and others, in Ponce. Under Spanish rule, the trade balance against the island was nearly \$13,000,000, while the balance of trade in favor of the island since the occupation is \$2,500,000. Exports and imports have increased from \$25,000,000 to \$44,000,000, while the appraised value of real property in the island has risen from \$30,000,000 to \$100,000,000. To one who has visited the Island constantly for the last five years the improvement in general business is very noticeable.

The population of the Island is dense for its area, and in Spanish times and during the first year or two of the American occupation many a poor laborer could not get employment and was obliged to subsist on wild fruits and live as best he could. At that time any number of men could be found who were glad to work for almost any sum. Today, everybody can find employment, either on a sugar plantation, in the mills, in the coffee districts, or, last but not least, in the tobacco fields in the centre of the Island. The American Tobacco Company has invested large amounts of capital, adopted the most modern methods of cultivating, curing, packing and shipping, and the result is that where native growers formerly employed a few hands the so-called "Trust" has given employment to thousands and is carrying on an up-to-date business in a way that is delightful to contemplate.

The sugar industry which is, and probably always will be, by far the largest in the Island, has proceeded along the same lines. A very large amount of capital has been invested by leading financiers in the United States and the entire system of making sugar has been revolutionized. Formerly the hills and valleys were dotted with small sugar mills which ground the cane in a very wasteful way and shipped their sugar to commission merchants in

the large towns, a few bags at a time. Rarely has there been seen a similar example of economic waste, and the change that has taken place is very great. Large "Centrales" have been established at convenient shipping points in the centre of the sugar districts and railroads built to carry the cane directly from the field to the mill, insuring continual operation and a far better product than formerly.

In this line, Porto Rico has the advantage over the other Islands in the Caribbean Sea of not paying any duty on the sugar shipped to the States. The soil is of the best, and although on the south side of the Island droughts occasionally curtail the size of the crop, a very fine system of irrigation exists and is being constantly extended.

The result of all these increases in activity is that Porto Rico now stands on a firm footing, and the Stone & Webster property in Ponce has passed the condition of experiment and is now an assured success. With the growth of the railway the lighting and power business has also been developed and since the consolidation with the native company, which was effected in 1904, the growth of this department has been remarkably rapid. On the lighting side the summer and winter peaks are not as noticeable as with us, for the reason that there is not very much difference in the length of the days between the two seasons.

The Porto Ricans are very proud of their city lighting and use it to the best advantage in illuminating their squares and public places. Furthermore, it is considered a mark of respectability to use electric light, and many a shack containing a large family and which costs not over \$15.00 to build is lighted by an electric lamp at a cost of \$1.00 per month.

Power is sold to many small industries, such as coffee mills, fruit shippers, small pumping plants and various other installations where the use of isolated plants would be inconvenient and cumbersome. It is probable that the use of power for irrigation purposes will be very largely extended. The growth of the business may be seen from the following table:

GROSS EARNINGS.

1903	 \$47,339.14
1904	 73,744.55
1905	 88,573.80
1906	 107.264.86

For 1907, the five months to June 1 show an increase of over 19 per cent.

In the early history of the enterprise it was clearly seen that it would be necessary, owing to the high price of coal and the expense of making repairs at such a distance from modern machine shops, to study very carefully the matter of expense, and after construction was completed it was decided to operate Ponce on what may be called a "student" basis. Following out their general policy of sending young technical and college graduates to the various companies, Stone & Webster have for the past four or five years filled all the official positions with men of this special training.

George C. Towle, who was the engineer in charge of construction, remained only two months time after the opening of the road and was succeeded by Horatio Bigelow, who remained as manager. He was followed by David Daly, a graduate of Harvard, 1901, who had gone down as a student and by this time had charge of the railway operation. Mr. Daly is now manager at Houston, Texas. He was succeeded by Marcy L. Sperry, of the Institute of Technology, who had been in Ponce for some little time as assistant treasurer, and after leaving Ponce went to The Minneapolis General Electric Company as Superintendent. Following him came Gardner Rogers, also an Institute graduate, who has recently taken Mr. Sperry's place at Minneapolis, the latter having been promoted to the position of manager at Savannah. Thomas Nickerson, who was formerly assistant treasurer at Ponce, is now manager at Woonsocket, Rhode Island. Mr. Rogers was succeeded by Herbert S. Whiton of the Lawrence Scientific School, who went to Ponce some three years ago as engineer in the power station. He is now manager of the company.

The present list of local officers is as follows:

Manager	Herbert S. Whiton
Superintendent of Lighting	E. B. Cooper
Assistant Superintendent of Lighting	gEdward T. Steel
Superintendent of Railway	Walter P. Ingham.
Chief Engineer	.Jefferson Alexander
Assistant Treasurer	James B. Walker
Bookkeeper and Cashier	N. J. Waters

These young men together occupy a house in the immediate vicinity of the office and power plant, and one of their number is assigned to the duties of housekeeping. During Mr. Daly's in-

cumbency certain questions arose as to the management of servants, the employment of cooks, etc., but, with better knowledge of what is required, has come a smoothness of operation which can only be acquired by experience. Certainly one visiting the house today finds comforts and even luxuries which were unknown to the early settler. The advantage of thus living together is apparent, as the men in all departments confer freely with each other, and when any question arises thrash it out among themselves and decide what it is better to do. The necessity for this arises from the fact that it requires seventeen days to get an answer by mail from the Boston office and that cables cost seventy-five cents a word; furthermore, the spirit of good fellowship which such living promotes is very apparent and much for the interest of the company.

TWO INTERESTING PIECES OF WORK

BY E. J. EMERSON.

The street railway companies of Dallas are just completing two good sized jobs in paving and track construction, which, while both of the concrete stringer type, differ somewhat from each other, as well as from the type of construction used in other cities, and it might be of interest to note the difference in these pages.

In the construction of our Ervay street line, which is just being finished, no wooden cross ties were employed, but in addition to the customary round tie rod midway between the base and the top of the rail, a tie bar was clamped to the base of the rail at points equi-distant from the round rods. The ties or rods of each set were placed 10 ft. apart. The upper round rods were 3-4 in. in diameter, and were bolted through the rails in the usual manner. The lower tie bars were 1-2 x 1 1-2 in. bar iron, extending under the rails and fastened in a vertical position by a special clamp on each side of each rail.

Nine in. 95-lb. 60 ft. length groove girder rail was used, these being bolted together with eight bolt continuous rail joints and electrically connected by two 4/0 American Steel Company's plug bonds; while at the steam railway crossings, the connection was made through old 75-lb. Tee rail, laid under the crossing, and connected on either side to our rails by long bonds.

This work being of double track construction, the city compelled us to have our outside rail of each track 1-2 in. lower than the inside rails, and no super-elevation was allowed on the outside rails of curves.

Before any of the rail work was laid, trenches to receive the concrete stringers were excavated, and the rail, after being laid in and bolted together, was suspended and surfaced on wooden blocks over the trenches, for several hundred feet ahead of the concrete gang.

The concrete stringer proper under each rail, was 18 in. wide x 13 in. high, one inch of which came above the base of the rail, all forming an integral part of the 6 in. concrete base for the bitulithic paving, which concrete base was placed between the rails and the track, and to the street curb line.

The concrete was composed of one part Portland cement, three parts sand and six parts broken lime stone of graded sizes, not more than 2 1-2 in. or less than 1-2 in. in size. A portable steam operated continuous mixer was used for this work.

In putting in the concrete stringer, space was left around the blocks and wedges, supporting the rails, and after the concrete had set, the blocks were removed and the holes left by them filled in.

The concrete was allowed to set seven days before cars were permitted to run on the tracks.

The street was finished with a two-inch layer of bitulithic pavement, which was carried up to the rails without the use of paving blocks or bricks.

The paving and concrete work was done under contract by the Texas Bitulithic Company. The track work was done by Stone & Webster Engineering Corporation, all of the construction being under our supervision.

Our Forest Ave. track while of the concrete stringer type of construction, differs somewhat from Ervay street work, in that we used in connection with the 3-4 in. round tie rod, at 10 ft. centers, a 6 in. x 8 in. x 7 ft. heart pine tie, treated with carbolineum, instead of the 1-2 in. x 1 1-2 in. iron bar ties.

The rail used was the same as that used on Ervay street, a 95-lb. 9 in. groove girder rail, which was connected by the same style continuous joints and electrically connected in the same manner as the Ervay street work.

The pine ties were placed four foot centers, and after the trenches were dug and the track laid in place, we found that by simply tamping the center and end of ties the track could be held to line and surface in this manner, without using blocks, as in Ervay street construction.

The trenches for the concrete beam under each rail were dug 18 in. wide and 15 in. deep. This gave 8 in. under the ties, 14 in. under the rail (where there were no ties) and one inch above the base of the rail, this latter being made necessary to meet the 6 in. base for the paving. The upper inside corners of the trenches were shaved off six inches, in order that an arch might be formed by the concrete stringers and the 6 in. pavement base.

The proportion for the concrete, as well as the system of mixing, was the same as that used in our Ervay street work.

The finishing surface was also the same as that used on Ervay street, being 2 in. of bitulithic pavement.

The paving and concrete work was done under contract by the Texas Bitulithic Company. The track work was done by our own construction gang.

GROWTH

BY R. A. PHILIP.

Growth is vital to the electric service business. Electrical equipment cannot be purchased with the expectation of using it until it fails from the decay of time or the wear of use. Time and use are slow, but advance in the art is rapid, so each machine while yet in its prime becomes obsolete.

The old machine is obsolete because a new one can do the work enough cheaper to pay the fixed charges on its cost and leave a little margin besides. One advance in the art follows another, each new machine is replaced by one still newer. Each successive improvement cuts a slice from the operating expenses and adds one to the fixed charges, until it becomes evident even to those outside that the cost of the service is largely fixed charges and that the greater part of the fixed charges represents capital which was invested in equipment since discarded. Conditions are then ripe for a new company to come into the field without this disadvantage and furnish service at a less price and with a greater profit.

Against this fatal outcome the company already in the field has one weapon which is sufficient if used in time,—growth. Each improvement of the art broadens the field of usefulness of the electric current, one increases the economical radius of distribution, another increases the economical size of units, and a third adapts the same current to light and power. If the electric service company grows as its field enlarges, it will discard its old apparatus because it is outgrown as well as obsolete, and the new equipment will have two margins of economy instead of one.

The second economy due to increased size of business may be expected to pay the fixed charges on the discarded equipment and give a margin besides, because the economy is obtained on the whole of the larger plant, while the fixed charges represent only the original portion.

The established company is now in a position to carry along the charges on its former equipment and still furnish service at a profit cheaper than a smaller competitor can afford. Further, there is no undeveloped business to tempt a competitor. No rival can at once secure sufficient business to obtain the economy which pertains to large size, nor can any grow to sufficient size without itself passing through the same development stages, and therefore having equivalent fixed charges for discarded apparatus.

Until the end in the advance of the art is reached, the vitality of an electric service business depends on its growth; every improvement will weaken it if it does not take advantage of the opportunities to grow.

Some Practical Features

A "WONDERFUL" METER.

BY J. C. WOODSOME, Houghton, Mich.

When men of the same class of business get together they usually start to boast. Well, by means of this Journal we companies get together, and to be consistent we are going to boast. We are in the business of selling electricity. We do not guess at the amount furnished our customers, but measure it. We use several types of meters, and if there is anything we pride ourselves on it is the accuracy of these meters. We have a very good equipment of testing instruments and our men know their business. When it comes to adjusting a meter we know enough to eliminate friction, as well as to compensate for induction. We are experts in this work. In fact, we are beginning to believe that we are in a class all by ourselves. Nor is this self esteem altogether the product of our own vanity; it has been forced on us.

From earliest times men have worked on the problem of perpetual motion. Some have developed "remarkable" machines; others have met with signal failure. It now seems that in our efforts to obtain perfect working of our meters we have unconsciously solved the problem.

You may have some doubt of this, and to allay this doubt we quote the following, which was recently received from one of our customers:

"When I called your attention to that you sent a man and changed the meter. When the meter was taken out to have another replaced, the old meter still kept running on the counter two hours after it had been disconnected. I called the man's attention to this, and he thought it was a 'wonderful' thing. As I believe that this has been going on for the past three years, I believe that the company owes me at least \$200. Would like to have you give this matter your immediate attention."

This is the evidence. We do not care to discuss the merit of the evidence, so waive all argument. We told you we were going to boast. We told you we were in a class all by ourselves in meter work. We have submitted proof (?) of this and close the matter here.

It would be interesting, however, to hear from others, if they feel entitled to boast on this or any other subject.

RECORDING STATISTICS.

BY H. F. CUTTER, Fort Worth, Tex.

The method of keeping a record of the statistics of operation of the company at Fort Worth, is much the same as that used at the Boston office. As would naturally be expected, "curve sheets" form the backbone of our system, although some of the data are preserved in columns of figures in the old-fashioned way.

There is one important difference between the statistics of this company as kept in Boston and as kept in Fort Worth. At Boston, all values are the so called "twelve months figures," whereas we find it of more advantage to plot monthly data, since locally it is more important to know the operating details this month as compared with the same month last year, than it is to know our standing this twelve months as compared with the corresponding twelve months of the previous year.

The fact that we operate an Interurban Division opens a prolific field for the statistician. The possibilities of the situation are shown by complete records of the "earnings" and "passengers carried" between stations on various kinds of tickets, and on cash fares. In this connection it may be noted that although the new "anti-pass law" has made some of our carefully compiled records of free transportation practically worthless, we do not feel that we have suffered any severe loss thereby, inasmuch as we are now able to turn hopefully to a comparison of conditions existing during the "ante-anti-pass law" days and at the present time.

TRACK BUILDING AT FORT WORTH.

BY H. M. FLANDERS, Fort Worth, Tex.

During the last twelve months, the Northern Texas Traction Company has built six miles of single track, not including necessary turnouts and the new car barn layout at Oak Cliff. Of this work, 5.4 miles have been built in dirt and gravel streets, and .6 miles in a street paved with asphalt on a concrete foundation.

The track in dirt and gravel streets is of 60 lb. tee rail construction with 6 in. x 8 in. x 8 ft. burnettized pine ties spaced two feet center to center on a 6 in. foundation of gravel. The track in paved street is of 9 in. 95 lb. grooved girder rail construction, on 6 in. x 8 in. x 7 ft. creosoted pine ties spaced four feet center to center, with 7-8 in. round tie rods, spaced five feet center to center embedded in concrete which extends from 6 in. below the bottom of the tie to within two inches of the top of the rail, forming the base for the asphalt pavement.

Within a few days, the work of relaying about nine-tenths of a mile of the Hemphill line with 9 in. girder rail will start, and also about two miles of 60 lb. construction in North Fort Worth. As soon as the necessary rail is received, about two miles of the College Line will also be relaid with 60 lb. tee rail, replacing the 40 lb. rail.

BUILDING UP TRAFFIC.

BY C. L. SYKES, Fort Worth, Tex.

The Passenger Department of the Northern Texas Traction Company continues to feel encouraged over the steady increase of regular traffic, and more especially over the popular demand for "special cars" by private parties, political and religious organizations, lodges, etc.

Great care is taken to give prompt and efficient service and to avoid anything that might tend to mar the pleasure of the trips. The last "special" of particular note was one chartered Sunday, June 23, 1907, by the leading business men of Fort Worth to carry Mr. William Jennings Bryan from Dallas over the Interurban Line to Fort Worth. Mr. Bryan's visit was of no particular significance, as he came under the auspices of the Fort Worth Chautauqua; but his many friends took this occasion to pay their respects. The trip was a success in every particular.

The Northern Texas Traction Company has twenty agents selling tickets on the Interurban Line. The Texas & Pacific Railway Company has used for years past, as a sort of trade-mark on all of their advertising literature, "No trouble to answer questions." The Passenger Department of the Northern Texas Traction Company in its instructions to agents has inculcated the spirit of fur-

nishing information fully and cheerfully. Might it not be a help to adopt as a trade-mark, "Questions your Privilege," "Answering our Delight"? For an agent, we must consider, must not only give the information asked, but should do it in a pleasing manner, thereby making a pleased passenger, the best advertisement the company can have.

SUCCESS IN TRAIN DESPATCHING.

BY A. G. ROSSER, Handley, Tex.

The Northern Texas Traction Company in handling its Interurban Line operates under the American Standard Railway code of rules as nearly as possible. Trainmen stand an examination under this code before they enter the actual service on lines. Our best Interurban trainmen are those having both steam railway and street railway experience. Three dispatchers are employed by the company, working a shift of eight hours apiece, using telephones instead of telegraph for their dispatching. We find that in using telephones we talk directly to the trainmen who are to execute the orders given, and that we have no sidings where we are not able to communicate with trainmen, saving delays and sometimes a tieup. Dispatcher gives the order to the conductor in charge of train, first giving the number of order, then following with the order. Conductor receiving the order repeats the order back as dispatcher sends it, and on completion of order repeats entire order back to dispatcher, dispatcher giving complete and time on same. Conductor then hands order to motorman, who in turn reads order back to conductor before starting his train. We use the standard (31) form of train order, and great care is taken in making all orders as clear and simple as possible. No complicated orders are allowed to be put out. We also have a standard form of clearance card, and on these clearance cards the numbers of all orders for this one train are given. Our time table shows positive meeting points for all time-carded trains. Trains meet as per time table unless otherwise ordered by the dispatcher. We have no right of direction. Trains hold their rights until twelve hours late. We only have two classes of trains time-carded. They are, first and second class. First class trains have the right to proceed, unless otherwise ordered by the dispatcher, against all second class trains. Extra trains have no right except that given by the dispatcher in a 31 train order. We have register books located at terminals and a

dispatcher's office, where conductors register their train numbers, car numbers, time in, time out, conductor's name and signals carried from and to, if signals carried. All instructions governing the movement of trains must be given in writing.

We find that in cases of trouble a clear head is the most important successful part about train dispatching.

Dispatchers giving orders and trainmen receiving and executing them, should not become worried or angry in any way at each other. This sometimes is the cause of our most serious accidents, and can be avoided by kind treatment on the part of the train dispatcher in giving trainmen what they want as long as he can keep both sides in the clear. When he gets off duty he can then show them where they were wrong. Besides, in cases of trouble we have use for telephones in giving orders and no time for arguments. A successful train dispatcher should leave his temper at home and should be an artist in keeping mankind in a good humor, attending to business, and smiling at everyone. Be sure you are right and then go ahead.

My experience as a train dispatcher has been that one can do more after the situation presents itself. Train dispatching is a serious proposition and should be given as much notice as possible.

KEEPING DOWN EXPENSES.

BY H. T. EDGAR, Fort Worth, Tex.

The Northern Texas Traction Company has adopted a bogie for the year 1907, and efforts are being made to keep the company's earnings and expenses as near the bogie as possible. In order to accomplish this, a daily expense sheet for each amount is kept each month. A few days before the first of the month the management notifies the head of each department how much money he can spend in his department for the month.

A clerk is specially employed to keep this record of expenses. He keeps a separate sheet for each expense, the sheet having upon it either thirty or thirty-one lines, each line indicating a day of the month. The expense of each account is divided into two items, labor and material, and the expense incurred by each department for each account for each day is kept on this sheet. In this way the manager is enabled to see each day just how his expenses are running and to check or cut out any expenses that are running over the bogie. Of course it is not always possible to cut expenses, even

though they are running over the bogie, but a great many times this can be done and the expense put off into the following month.

In this way, the manager knows practically what his expenses are going to be for the month, and it affords him a very much better opportunity of keeping the expenses within the bogie.

THE CLAIM DEPARTMENT.

BY W. C. FORBESS, Fort Worth, Tex.

The Claim Department of a transportation company, whether steam or electric, is an important department in the organization of such company; and yet it produces no revenue, but on the contrary constantly drains on the treasury of the corporation.

The Claim Department not only has to deal with the public in general, but also has to be in close touch with its operatives. The Claim Agent is a trouble adjuster for the company, and it is largely his tact and disposition which make his services valuable to the company. He must, as far as possible, keep the company out of litigation; yet he must have the courage and backbone to turn down all unjust claims when a thorough investigation has developed that the company is not liable. At the same time, in rendering his decision he should use sufficient diplomacy and policy in his manner toward the claimant as not to incur enmity toward the company. This usually can be accomplished by a thorough discussion of the facts surrounding the accident with the claimant, at the same time telling him what the disinterested witnesses say regarding it.

It is to the Claim Department that a great many irregularities other than claims are referred, such as the passing up of prospective passengers, delay of cars, letting passengers off at improper places, and a great many other complaints of like nature. It is in such cases that the Claim Agent has an opportunity of making a friend or an enemy for the company, the same depending largely upon the attention he gives to the complainant; usually a satisfactory explanation can be made as to the possible cause of the complaint, with the promise to give the matter further investigation that will satisfy the party making the same.

MOTORS AND ARMATURES.

BY T. N. HARTIN, Fort Worth, Tex.

In putting motors on cars, we have noticed on different types that unless care is taken in tightening the pinions they get loose very easily. Shopmen should always bear this in mind, as the pinions and gear wheels are at the mercy of the motormen, and are used in the place of brakes many times each month; we therefore find it best in putting on gears and pinions to be extremely careful in tightening up the bolts.

The night inspector cannot be too careful in gauging his armatures in order that they may never be allowed to touch the pole pieces. It is a mistake for a shop foreman to try and get too much wear out of bearings, as he is likely to allow them to run too long, and the consequences are that the armature gets down on the pole pieces, knocks the band off the armature, and perhaps burns it out.

We find it better, however, not to allow the armature to get too close to the pole pieces before putting in new bearings. We have in operation 275 armatures, and our armature winder does not have enough work to keep him busy constantly winding armatures, and spends some of his time in the pit working on cars.

THE VALUE OF THE PRICE LIST.

BY W. L. WESTON, Fort Worth, Tex.

One of a Purchasing Agent's principal duties is the maintenance of an accurate price list. It requires very little time, and its advantages greatly outweigh any trouble entailed.

Each article purchased, without exception, should have its price recorded on a card, and that card filed alphabetically in a filing cabinet. By this method, and this method alone, can a Purchasing Agent check prices with any degree of accuracy. Without some such record it is impossible to determine just what firm is giving the best prices on a certain article. For example:

A requisition for material is received by the Purchasing Agent; he immediately refers to his price list, and from it is able to determine what firm will give the best price, and will place the order accordingly.

This record becomes invaluable when estimates are being made for construction work of any nature.

Take the form used for a price card by the Purchasing Department of the Northern Texas Traction Company. The name of the article is entered at the top of the card. In doing this, one must be careful not to use any vague or ambiguous name, such as "pinions," but should put "pinions for G. E. 81 motor," or some such specific description of the article.

The columns on the card readily explain themselves. Under the heading "remarks" could be inserted a brief statement of results obtained from the article, or other useful information. An extra column for "freight" should be added and would be found very valuable.

This system works admirably, and although it has been installed but a short time, we feel we are amply repaid for the time and labor spent in introducing it.

WIRING FOR LIGHTS.

BY E. E. NELSON, Fort Worth Tex.

The Electrical Department has just finished wiring for lights the new theatre and dancing pavilion at Lake Erie Park.

The lighting of this pavilion is done by 25-cycle, 100 volt current. We have used this kind of current because our Power House at Lake Erie generates three-phase, 25 cycle, 400 volt current. This 400 volts is stepped down to 100 volts by means of four to one transformers placed on poles outside of the pavilion. The pavilion is lighted with 287 sixteen candle power and 620 four candle power incandescent lamps.

The flicker of the lamps due to the low frequency used, is not noticeable in the sixteen candle power lamps, while the flicker can be detected in the four candle power lamps and would be objectionable in most places. The lamps are very satisfactory in the way we have used them, that is for decorative lighting.

We are also using, with very good success, this 25-cycle current to operate a moving picture machine arc light, although the flicker is much more noticeable in the arc light than it is in the incandescent lamps.

BAD FEED WATER.

BY E. L. WHITE, Handley, Tex.

The Power Station of the Northern Texas Traction Company continues to send out the "juice," notwithstanding the trouble which is occasioned by bad feed water. The question of feed water has been a serious one for some time. With the beginning of 1907, it was thought that the water question was solved, owing to the bringing in of an artesian well giving a four inch flow. This water, when turned into the boilers, steamed beautifully, and it was thought that "priming" was a thing of the past, but after a

while the water began to fail, necessitating using air to lift it, and shortly after there was no natural flow from the well, all the water being forced out by air. This well was drilled to a depth of about thirteen hundred feet.

Finally the water in this well became so bad that it was impossible to use it, and a chemical analysis showed quite a lot of carbonate of soda. It was then decided to try and repair the well, and water from the artificial lake was turned into the boiler. Upon investigation it was found that the well had filled up to a depth of three hundred feet or more, probably caused by caving in of the sides of the well. This caving of loose dirt, together with the agitation of the water by the air, probably brought up solids in suspension which aggravated the trouble of priming of the boilers. The water of the lake is a mixture of water caught from rains and artesian water condensed from the boilers, the condenser discharging directly into the lake. This water behaves very badly in the boilers, priming being a daily and frequently hourly occurrence.

Despite this trouble, there has been no serious interruption to the service, the voltage at the station being reasonably constant, except when the exciter engines get water. When this happens, the voltage drops very materially, as, in some instances, exciter engines will almost stop. Handicapped in this manner, we frequently pull through peaks amounting to from 2500 to 2800 kw., and even higher, the indicator of our 4000 ampere recording ammeter sometimes going over completely off the chart. This with a rating of 1800 kw. capacity.

On July 4, the output for the day was 35,000 kwh. Despite the unusual load, the station went through without mishap, except the heating of two step-up transformers. Heating was caused by heavy load.

News from the Stone & Webster Engineering Corporation

GENERAL NOTES.

In September, 1906, the Stone & Webster Engineering Corporation, foreseeing considerable rises in the price of copper, began to place future delivery orders, anticipating the requirements of the companies managed by Stone & Webster as far as they were able to judge them.

During the gradual rise in price of copper since September, 1906, future delivery orders have been placed for 1,950,000 lbs. resulting in a net saving to the companies of 26,675.

- F. W. Lund, who until recently was employed by the Fosburg Construction Company, general contractors, left Boston August 5, for Dallas, where he will act as Chief Accountant under Mr. Goodenough.
- R. M. Henderson, constructing engineer, who recently left the employ of Arnold & Company, contractors of Chicago, to associate himself with the Construction Department, is busily occupied in following up the construction work at Pawtucket, R. I., and Lowell, Mass.
- K. A. Andren will sever his connection with the Corporation September 1st to accept a position as general sales agent of machinery and rolling stock, with Thomas F. Carey, 70 State St., Boston, Mass.
- Mr. J. F. Vaughan, of the Engineering Department, returned August 1 from a trip to Key West and Pensacola.
- R. G. Hall, formerly Accountant at Dallas, is now connected with the Accounting Department at Boston.

- E. H. Sennott, who was previously employed as Accountant at Columbus, Ga., is now employed in a similar position in the Engineering Corporation's office at Lowell, Mass.
- F. J. Donovan, who was formerly Assistant Treasurer of the Pensacola Electric Company, has been transferred to the Boston office, where he is assistant to Mr. G. C. England.

BELLINGHAM, WASH.

We were somewhat concerned a few weeks ago to hear that Mr. S. L. Shuffleton had had a serious accident and was in the hospital with a chance of losing a leg. The following reassuring letter was received from him, however, under date of July 23, 1907.

"I regret to inform you that I had the misfortune to break my left leg by becoming entangled in the crank of a gasolene engine last Sunday; surgeons tell me that I will probably be in the hospital for a month or six weeks. Unless instructed to the contrary by you, I will, however, continue to purchase rights of way for the Interurban. I can direct this work from the hospital nearly as well as from the office, and I can also continue the engineering work by the same means."

It seems that Mr. Shuffleton is a hard man to put out of business.

KEY WEST. FLORIDA.

We have not been able to close up our organization at Key West, August 1, 1907, as we had hoped, owing to some unforeseen difficulties in the overhead reconstruction and to the fact that several of our line crew have been down with fever. It is confidently expected, however, that our work will be closed out by the middle of August.

JACKSONVILLE, FLORIDA.

Quick-sand has seriously interfered with the excavation for the new stack foundation. It was found necessary to take down part of the boiler room wall and temporarily support one of the present batteries of boilers. The excavation for the stack foundation has now been completed, and pile driving was begun August 1, 1907.

SEATTLE, WASH.

Mr. G. O. Muhlfield, Construction Manager, has been in Seattle during July and has thoroughly gone over the various

pieces of work which have been in Mr. Whitson's charge for the past year.

TERRE HAUTE, IND.

The work on the Paris extension is progressing favorably in spite of a very rainy summer, and it is expected that this line will be ready for operation by September 15, 1907.

(L. E. Eustis.)

News From The Companies

PLYMOUTH, MASS.

This attractive old town has increased yearly in popularity as a summer resort, and the summer of 1907 is no exception to this rule. All the cottages and hotels are full and an air of gayety pervades the place. The Pilgrim Hotel is enjoying its banner season; golf and motoring seem to be the chief amusements. On a pleasant Sunday, the stable yard might pass for an outdoor automobile show, so many cars are parked there.

Mayflower Grove is receiving its share of Plymouth's patronage and is doing much the biggest business in its history. Theatre receipts are running well ahead of the best previous season and all other amusements are making new records.

The problem of properly advertising park attractions in a section without a local daily newspaper is a difficult one, and an outline of the methods in use on one small road may be of interest.

On Tuesday of each week the agent supplying the theatrical attractions sends the bill for the coming week's show. Advertisements are then written up for the weekly newspapers, covering the show and any special attractions such as fireworks, balloon ascension, etc., occurring the next week. Reading notices covering all matters of interest in connection with the Park are also prepared for these papers. The cost of this advertising is small, as the space is taken by contract for the season.

The theatrical agent also supplies 100 one sheets for the show. Half of these are turned over to the local bill poster and are put on his boards at a cost of 4 cents each. Twenty-five of them are placed upon bill-boards owned by the railway company and placed in advantageous locations along the line. The remaining twenty-five are used in store windows, the window space being paid for by free transportation.

The company also gets out a number of dasher signs, 18x24, some of which are pasted on the usual dasher boards and carried on the cars, and others are placed in store windows. The latter locations are paid for by free transportation. Separate dasher signs are printed for each attraction, namely, one for the theatre, one for Sunday concerts, one for fireworks, etc., and the subject matter is limited to seven lines, making the sign easily legible on a moving car.

The work of placing this advertising in windows is done by the theatre ticket seller. This man also publishes a 4-page paper weekly, two pages being devoted to news concerning the Park and to advertising coming attractions, and two pages being filled with commercial advertising. Each issue is 10,000, of which 5,000 are placed in the company's cars, and 5,000 distributed from house to house in the various towns along the road. The commercial advertising yields nearly 100 per cent. profit over cost of printing, and this goes to the publisher, who assumes all financial responsibility and also gives the two pages for the use of the railway company free of charge. This little paper is an excellent means of advertising attractions and reaching the public. The supply in the cars is renewed nightly, and at the end of the week there are seldom more than a couple of hundred of the papers left in the cars. That the papers are a good advertising medium is proved by the fact that there are always several business houses waiting to secure space in the paper.

The object aimed at is to make it practically impossible for people not to know of the existence of the Park and of the attractions offered from week to week. The best advertising of all, however, is the theatre patron who has been pleased with the performance he has seen.

BROCKTON, MASS.

Brockton is now enjoying one of its old-time building booms. Contracts have been awarded for a new store and office building three stories high, to be built of brick and steel with concrete floors and roof, and to cost \$107,000. The three story building known as the Gardner Block is to be raised three stories, making it the first six story building in the city. The new four story brick building for the L. Richmond Company is in the course of construction, in addition to twenty or more three-flat tenement houses, two eight flat and one twelve flat apartment houses.

Work has been started on the Edison Company's new substation, the stock building, meter and arc lamp buildings having been razed to make room for this addition. It has been decided to make the substation building two stories in height, which will provide for an arc lamp room, meter room, linemen's room, stock room and draughting room on the second floor.

An order introduced in the City Council by the local laborers' union, calling for a Saturday afternoon holiday with a full week's pay for city laborers, created quite a little interest in labor circles, and caused a great deal of talk when it was passed by the upper board, where the Democrats and Socialists hold the balance of power, but on its reaching the lower board, where the Republicans are in the majority, the order was killed by a large vote.

With the building of our new station in East Bridgewater, the transmission lines across country to Stoughton and East Bridgewater, our new substation and underground work in Brockton, these are certainly busy days.

FORT WORTH, TEXAS.

The new pavilion and summer theatre at Lake Erie on our Interurban, which replaced the one destroyed by fire in May, was opened on June 25, and we expect this to give us additional travel on the Interurban between Fort Worth and Handley, for the rest of the season.

July 12 was quite an event in Texas, as on that date, which was ninety days after the adjournment of the legislature, several new laws went into effect. The principal laws affecting street railway properties are the tax on three-quarters of one per cent. on the gross earnings, the Anti-Pass law limiting the issuance of free passes to employees, dependent members of their families and a few other exceptions, and the separation of the white and colored races by means of signs placed in the cars.

On June 1, Mr. A. W. Q. Birtwell became assistant treasurer of the Northern Texas Traction Company, succeeding Mr. E. C. Reichardt. Mr. Birtwell was, prior to that time, assistant treasurer of the Houston Electric Company.

We have adopted solid rolled steel wheels on our Interurban cars, and the results, so far, have been very satisfactory. The first car equipped with these wheels has made 32,500 miles, and the wheels show apparently no cutting of the flanges. The only

STONE & WEBSTER

84 STATE STREET, BOSTON

General Managers of

The Lowell Electric Light Corporation The Seattle Electric Company Puget Sound Electric Railway Columbus Electric Company Cape Breton Electric Company, Ltd. El Paso Electric Company Jacksonville Electric Company Ponce Electric Company Northern Texas Electric Company The Minneapolis General Electric Company Edison Electric Illuminating Co., of Brockton Houghton County Electric Light Company Brockton and Plymouth Street Railway Company The Houghton County Street Railway Company Whatcom County Railway and Light Company Savannah Electric Company Dallas Electric Corporation Paducah Traction and Light Company The Blue Hill Street Railway Company Fort Hill Chemical Company Tampa Electric Company Pensacola Electric Company The Key West Electric Company General Electro-Chemical Company Houston Electric Company Galveston Electric Company Fall River Gas Works Company

STONE & WEBSTER PUBLIC SERVICE JOURNAL

SEPTEMBER, 1907

EDITORIAL COMMENT

A year or more ago, Judge Grosscup of Chicago, who had been commending himself to the good sense of the nation by his public utterances with reference to corporations, let fall some words which subsequent events have made even more impressive than when first uttered. "What is the sensible thing to do?" he "Destroy the corporation? Harass it? Hobble it? The sin in our corporate domain is not the legal structure known as the corporation. The corporation, pure and simple, is only a legal form under which men may associate their means together for a common purpose. It is the only way in sight to do great material things." All this would seem to be a mere truism. And yet the principle involved, though of the most elementary character, is like a good many other elementary principles, easily obscured. That fact is more strikingly attested today than it was twelve months ago.

No one is so courageous as to want to destroy the corporation. In many quarters there is, however, a strong disposition to "harass" and "hobble" it. True, this is merely the excess of righteous zeal; but zeal without knowledge, as we have been taught

on highest authority, is a dangerous thing. It is frankly admitted that there are good corporations as well as bad, and that the good probably greatly outnumber the bad. Nevertheless, the bad are such a factor for evil in our industrial and social life that they must be brought up at short turn, even if it is necessary to "harass" and "hobble" the good to effect this end.

The wisdom of such a policy may be seriously questioned. If no one were to suffer from the vicarious punishment of the good corporations but the members themselves, their treatment, though not morally justifiable, would work scant harm to the public. But that would by no means be the extent of the suffering. For, as Judge Grosscup has said, the corporation "is the only way in sight to do great material things." These great material things will be left undone to just the extent that the corporations are "harassed" and "hobbled." Everyone must hope for the speedy deliverance of the nation from the gross abuses of the bad corporations. But every one, if he is wise, will remember that great industrial abuses are no more easily cured than great physical and moral evils. Too abrupt cures are apt to mend the patient by killing him. A speedy dissolution of all the present bad corporations would, no matter how beneficial its final results, plunge the nation into financial and industrial chaos. And how unspeakable the situation, if the vicarious sufferings of the good corporations were allowed to go too far!

Of course it is the intention of no one to go so far as that. Even the bad corporations have, along with all their harm, done a vast amount of good; and the aim is, and should be, to eliminate their hurtful features without in the least impairing their efficiency for good. A moment's serious reflection will show that there could not be a more delicate problem than this. But impatience is not the best mood for serious reflection. Yet it is the mood on which the public mind is fast verging, if, indeed, it is not already there. Alexander the Great won an empire by cutting the Gordian knot with the sword. But the world has not many Alexanders. The success of bold, summary solutions of great vexatious problems depends a good deal on the nature of the problems. Some lend themselves easily to that treatment, while for others it simply makes the situation worse confounded. It is almost an

axiom that a rude hand should never be laid on the industry of a people. The mechanism is too delicate.

There is an old story of an Indian doctor who advertised that he could recover people from the cancer. It is recorded that he took a man so afflicted and bound him to a tree, and then burned him with red-hot irons until the tainted matter was eradicated. "There," he said, when the burning was completed, "I can't cure a cancer, but I can cure a burn." We suspect, however, that not all his patients came through the process alive. Nature works in more leisurely fashion, and it is conceivable that her way is best. If the mills of God grind slowly, they at least grind exceeding small, which is after all the main thing. There are no abuses harder to be borne than economic abuses. It is no wonder that the patience of mankind breaks down under them. But the breakdown of patience means hysteria, and hysteria in economic affairs is apt to mean prostration. When wine steps in, the man steps out; when hysteria bursts in the door, wisdom flies out of the window.

The Two Stages of Public Utilities

Public service corporations must inevitably pass through two periods. The first is the period of creation, the second the period of co-ordination and adjustment.

In the case of innumerable corporations, the first period is closed. What has been done has been done, and the record must stand. Innumerable new corporations are yet to be created, and it is safe to assume that those who create them will profit by the experience of those who built up the existing corporations. But it is not of these that we desire to speak at this time. What concerns us now are the existing corporations. These have recently entered their second phase, and this second phase is the object of our study.

Say what one will about the ethics or the economics of the first period, there is no denying that it has been productive of marvellous results. If we assume that the existing corporations have not been created and developed with perfect regard to the laws of justice and sound business, we nevertheless cannot ignore the fact that they have contributed enormously to the comfort and

prosperity of the nation. Just at present the public are viewing their defects with microscopic eyes. It was inevitable that the public should reach this point. They are tolerant of an institution which claims to have a proper intent, so long as it is engaged in getting a foothold. But when once it has demonstrated its strength, they claim the right to subject it to criticism to see if it is properly fulfilling its mission. Public servce corporations cannot and do not expect to escape this fate. All they ask is that the criticism shall be both honest and intelligent.

Criticism does not mean fault-finding. It may or may not result in that, as the facts determine. A critic is one "versed in the art of weighing the merits" of a thing. To "weigh the merits" of public service corporations is not only a privilege of the public, but also a duty. The State grants the corporations the right to exist, and it is incumbent upon it to see that its creatures properly perform the tasks to which they have been appointed. The State is in the position of a parent to the corporations, and it is highly important that it should act as a wise parent. Its judgments should all be based upon patient investigation of conditions, and in no case should they spring from passion. Its aim should not be to punish, but to correct and encourage. That is the sole function of every kind of criticism, using that term in its scientific meaning.

During the first or creative period of corporations, criticism is usually dormant. At most, it is sporadic rather than general. The fact that it is now general is sufficient proof that the second period has been reached,—the period of co-ordination and adjustment. Let us consider for a moment what this means.

It is perfectly easy to see why criticism is not general during the creative period. During that period the State has but one motive; namely, to induce capital to flow into public utilities with the utmost freedom. It is careful to put no restraint upon it. All it thinks of is to get the public utilities necessary to its development as rapidly as possible. At this stage it is prepared to pay a high price. The industry of a State never has been and never will be built up on a preconceived, systematic plan. In its initial stage, and far beyond its initial stage, it is the product of the need of the moment. To satisfy the need of the moment, all sorts of bounties are offered to capital. Corporations are granted the most liberal charters, excessive capitalization is winked at, franchises are given away, high price for service is willingly paid. In short, incense is burned without stint on the altar of capital.

Capital, to change the figure, is wooed until it is caught and made to produce highly effective results, and then criticism begins. At the start, the services performed by public service corporations are not viewed as a birthright, as something which every individual has a right to on coming into the world. They are regarded as something to be prized, but also as something to be bought and paid for, as one buys clothes or pictures. That is the way a community looks at them before it has them. After it has acquired them and has enjoyed them for a few years, it takes quite another view. It then considers them almost as essential as air and sunshine, and is prone to murmur at their being treated as purely commercial factors.

Criticism, like everything else, is first tentative. It is not born full fledged, but it is the product of long years of thought and experience. It is only by such process that correct standards of judgment are reached in any department of thought or activity. It is in this way only that the public can build up a sound criticism of public service corporations. The task is a most difficult one,—far more difficult than may appear on the face. The State by its past treatment of the public service corporations has bred in them many things which it now finds objectionable. Yet it cannot eliminate these by a stroke of the pen. It cannot encourage capital to risk itself in doing a certain thing, and say when the thing is done, "This is all wrong, and you must take the consequences." That would be neither honest nor expedient.

It would be absurd to say that the American public service corporations have of themselves bred the conditions which so many people now consider objectionable. The public service corporations are the creatures, not the creators, of their times. They are what the ethical and industrial sense of the American people has made them. They are no better and no worse than their day and generation. Neither on moral nor on economic grounds can the public service corporations be regarded as objects of reprisal. From the point of view of morals, the public are as much to blame as the public service corporations. From the point of view of economics, the public must bear in mind that when Samson avenged himself on the Philistines he wrought his own destruction as well. The tie between the public service corporations and the State are too indissoluble to admit of harm to the one without injury to the other.

The old order is constantly changing, and new times breed

new conditions. The relations existing between the public service corporations and the State in the creative period of our public utilities were not of necessity permanent relations. capable of readjustment in the face of changed conditions. would be folly for the corporations to take refuge in abstractions. They may claim that the relations between themselves and the State have heretofore been based, with the implied consent of the State, upon cold, calculating commercialism, and that of right such should continue to be their basis. But the Anglo-Saxon mind does not reason in that way. What were once mere luxuries—to be paid for as luxuries—have practically acquired the character of necessaries of life. The community might conceivably have got along without gas, electric light and power, and steam and electric traction; but having once adjusted itself thoroughly to these utilities it cannot abandon them without disaster. Whatever the theory may be, the practical sense of the American people tells them that they have acquired a prescriptive right to the great public utilities.

The public service corporations recognize the soundness of this view. They clearly perceive the necessity of adjusting themselves to it. It is no new view to them. It is exactly the view which self-interest, to say nothing at all of public opinion, was bound to force upon them. The present agitation for a severer disciplining of public service corporations is no doubt hastening the process of readjustment, but haste is not always the best policy. What is needed is a safe adjustment rather than a quick one. It is to be hoped that the crudity which characterized the creative period of public utilities will not be duplicated by a crudity in the period of readjustment. For in that event, the last evil will vastly outweigh the first.

CIVIC FEDERATION ON MUNICIPAL OWNER-SHIP

The final report of the National Civic Federation Commission on Public Ownership and Operation has at last been given to the public, through the medium of advance newspaper abstracts. The three large volumes embodying the report, containing, it is said, no less than a million words, besides masses of tabulated statistical data, are at this writing still in the hands of the printers and unavailable. The abstracts and critical reviews furnished to the press, however, give a fair idea of the scope and meaning of the long awaited compilation.

The Commission was created two years ago by the Civic Federation, to investigate and report on the general subject of municipal ownership and operation of public utilities. Its activities have been directed by an Investigating Committeee, including in its membership many well known business men, educators and publicists. Among these are Melville E. Ingalls, Chairman of the Board of Directors of the Big Four Railroad; Dr. Albert Shaw, Editor of the Review of Reviews; Prof. E. W. Bemis, Superintendent of the Municipal Waterworks of Cleveland, Ohio; William J. Clark, of the General Electric Company; Prof. John R. Commons, of Wisconsin University; Charles L. Edgar, President of the Edison Electric and Illuminating Company of Boston; Prof. F. J. Goodnow, of Columbia University; Milo R. Maltbie, recently appointed a member of the Public Utilities Commission in New York; H. B. F. Macfarland, President of the Board of Commissions of the District of Columbia; Prof. Frank Parsons of Boston, President of the National Public Ownership League, and others, among them several representatives of organized labor. The Commission employed for its investigations technical experts, engineers, accountants and statisticians, who with members of the Commission, visited a large number of public and private enterprises in the United States and Great Britain.

It is now certain that the report must not be looked to for a complete or decisive conclusion on the subject under examination. At best it contains materials which, suitably treated and combined, may produce illumination. At first glance it may seem a matter of regret that the Commission was unable to resolve all doubts and contentions, but this it was never really reasonable to expect, and hope of such a result could not possibly have survived an exposition of the methods of research adopted. In the introduction to the review of the work of the Commission's experts, is the following under the head of "Impartiality":

"In order that the inquiry might be thoroughly impartial, it was the almost invariable rule, in the selection of experts, to allow, with regard to the four public utilities within the scope of the investigation, each of the two leading elements of the Committee, the 'pros' and the 'antis,' an expert of its own choice; and in the work of examing each plant, a representative of the one side worked with the expert of the other."

Doubtless for a Commission made up of "pros" and "antis" this represents a well balanced, as well as an inevitable, policy. But it is significant that even in the examination of specific data the conflict of preconceived opinion was never for a moment lost sight of.

Nor do the results of what was evidently a desperate attempt to reach final and practically unanimous conclusions, furnish any foundation for a wish that further effort had been expended to that end. "There are some general principles," says the report, "which we wish to present as practically the unanimous sentiment of the Committee"; and then follows several declarations of which the following is a sample:

"There are no particular reasons why the financial results from private or public operation should be different if the conditions are the same."

This, of course, could be agreed upon by everybody, because it is utterly devoid of meaning. The conditions never are and never could be the same. One could walk on water as easily as on land if the conditions were the same, but human knowledge would not be advanced by such a statement even if it were written on oak leaves as the official utterance of the most solemn midnight conference of owls. It is easy to reconstruct from the result the

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method by which such a sentence was produced. The process is one of elimination. Imagine a long table with a secretary at one end and a goodly company of "pros" and "antis" seated along the sides. There is a common and praiseworthy desire to be unanimous. The secretary reads a proposed conclusion. It is significant, important, full of meaning. Debate ensues; becomes tiring, if not tiresome. Changes are rung, but unanimity still sulks in the distance. It becomes evident that not phraseology but sense causes the conflict. But agreement must be reached! If there cannot be unanimity as to sense, let there be unanimity as to no sense. Someone proposes a phrase which will suck the meaning out, leaving the "conclusion" harmless. The tired debaters seize upon the expedient eagerly and pass on. A few, perhaps, smile as they stoop to examine the next number. But there is practical unanimity.

A somewhat similar process undoubtedly produced the "conclusion" bearing most clearly upon the vital subject of the inquiry. The report says:

"We have come to the conclusion that municipal ownership of public utilities should not be extended to revenue-producing industries which do not involve the public health, the public safety, public transportation, or the permanent occupation of public streets or grounds, and that municipal ownership should not be undertaken solely for profit."

The last clause of this sentence has a real and important meaning and the fact that it escaped the eliminating process is exceedingly significant, but the rest, although on casual reading appearing to embody a profound utterance, is found, upon examination, to say almost nothing at all. The principal utilities involved in the general discussion of municipal ownership and operation are water works, car systems and electric and gas lighting enterprises. These all come under one of the headings as involving public health and safety, or transportation, or the use of public streets or grounds. By the form of the utterance the Committee excepts these from its "conclusion" and in effect earnestly assures the public that, having examined carefully the facts relating to water works, gas, electricity and street cars, it has come to the conclusion that municipal rabbit-warrens, golf links, potato patches, etc., (that is municipal enterprises not included in the exception) if revenue-producing and unconnected with health and safety, are undesirable. This is interesting, but not very important. How the "pros" and "antis" must have struggled over this deliverance, and how finally negatives were substituted for affirmatives in the search for unanimity, are all too clear.

While nothing in the "conclusions" reached upon the vital points at issue can be regarded as complete or decisive, some points upon which experienced students on both sides were already known to agree, are restated with a clearness which may be edifying to those who may be described as crude "pros" or crude "antis."

Thus it is agreed in the report that as the public utilities studied "are so constituted that it is impossible for them to be regulated by competition," they "must be controlled and regulated by the government," publicly operated, or "left to do as they please," the latter being a course advocated by no one. If properly read this will give pause to those who are advocating competitive municipal plants, as well as to public service corporation managers, if any there be still in darkness, who imagine that they are conducting purely private enterprises. A final statement in the summing up, that "public utilities, whether in public or private hands, are best conducted under a system of legalized and regulated monopoly" is perhaps the most definite and authoritative declaration of the report.

Again, the report voices the enlightened demands that a competent public authority should have power to require for all public utilities a uniform system of records and accounts, that each city operating public utilities should separate the finances of these undertakings from the general fund accounts, that political influence and personal favoritism should be excluded under such circumstances, etc.

It is likewise significant that the "pros" were not unwilling to include in the report some very plain talk addressed to the less discriminating adherents of their favorite doctrine. The agreement that "municipal operation should not be undertaken solely for profit" has already been alluded to. This sounds like a not surprising warning that too much should not be hoped from this frequently exploited feature.

On the capacity of cities to operate utilities the tone of admonition is even more distinct. The report says:

"We wish to bring to your consideration the danger here in the United States of turning over these public utilities to the present government of some of our cities. . . . There seems to be an idea with many people that the mere taking by the city of all its public utilities for municipal operation will at once result in ideal municipal government through the necessity of putting honest and competent citizens in charge. While an increase in the number and importance of municipal functions may have a tendency to induce men of a higher type to become public officials, we do not believe that this of itself will accomplish municipal reform. We are unable to recommend municipal ownership as a political panacea."

This is the pricking of a favorite and attractive bubble, for which the Commission is entitled to credit and praise. The slippery eels of the municipal ownership debates have been those who, admitting that profits from municipal enterprises may often be wanting, and that service may often be inferior, have nevertheless declared that municipalization should go forward, as a feeder to the "higher civic life" of the community. It is a comfort to have these fellows finally landed in the basket, with the lid securely on.

That the Commission has thus failed, except incidentally, to reach general conclusions of importance and value, must not be taken to mean that its two years of labor have gone for naught. Far from it. Data of inestimable value have unquestionably been secured, and it makes very little difference, so long as substantial accuracy has been insisted upon, what immediate effect these data have produced upon the minds of the Commission's critical (and already convinced) reviewers.

The full benefit of the work will not be felt until long after the three volumes, with their million of words and their tabulated expanses, have been distributed and digested, not by "pros" and "antis" but by mayors, councilmen, legislators, governors, public spirited citizens and leaders of public thought. It is to be feared that the vast extent of the production will delay this salutary process. While some earnest students who have mourned the scarcity of reliable information regarding municipal ownership may welcome the full report, as the poor old lady who had lived all her meagre life in a crowded tenement welcomed a sight of the ocean, exclaiming "I am glad for once in my life to see something there was enough of"; a majority probably will say of the report, as Macaulay said of Dr. Nares's memoirs of Lord Burleigh, that it might have been considered as light reading by Hilpa and Shalum,

but unhappily the life of man is now three score years and ten and it is unfair of the Civic Federation to demand so large a portion of so short an existence. Nevertheless the report will be welcome when it emerges from the bindery, and will be digested—in time.

Besides the summing up, the Commission has issued to the press some advance abstracts of critical reviews of the reports of the bi-partisan experts, which call for brief comment, though a sight of the reports themselves would be more welcome. Following its policy of balancing, the Commission appointed four persons, "two on a side," to review critically the results of the inquiry in the United States. Two of these, Mr. Walton Clark, Vice-President of the United Gas Improvement Company of Philadelphia, and Mr. Charles L. Edgar of Boston, President of the Edison Electric and Illuminating Company, severely criticise the municipal plants examined; while Prof. Frank Parsons of Boston, President of the National Public Ownership League and Prof. Edward W. Bemis, another active advocate of municipalization, praise the municipal plants at the expense of private operations.

Obviously these "reviews" are intended to offset each other, and so far as one may judge from the abstracts, they are, in this, Both "sides" perform their functions with vigor quite successful. and the contradictions are full and complete. It is interesting to note, however, that by the shock of the onslaught, Prof. Parsons and his associate were at the very beginning forced to fall back upon the old entrenchments, declaring that in most discussions of the municipal ownership problem "too much attention is given to the purely financial side of the question." "Dollars and cents are not to be neglected," says Prof. Parsons, "but life, liberty, justice, virtue and intelligence—the whole character product and social product of our institutions—are of greater moment than their money product." Thus one particularly slippery eel manages to slide out of the basket. Perhaps this was written before he was landed; that is, before he signed the report in which municipalization as a process of civic reform is distinctly and decisively refused endorsement.

Equally interesting and significant is Prof. Parson's defense, a part of this review, of the failure of municipal ownership in Philadelphia. Philadelphia never had real public ownership, he says because while the municipality owned the gas works, the politicians owned the municipality. Doubtless this is true, but in stating it Prof. Parsons no less certainly begs the whole question.

The evils of political influences under municipal ownership, and works in Philadelphia did not promote liberty and justice and virtue, which he says are sure to follow in the wake of extended municipal enterprises.

Other critical reviews made public are by Mr. William J. Clark and Prof. Parsons on the expert examination of British tramways; Mr. Milo R. Maltbie, Mr. Walton Clark and Mr. Charles L. Edgar on British municipal enterprises other than tramways; Prof. John R. Common and Mr. J. W. Sullivan, of New York, Editor of the Clothing Trades Bulletin, on labor conditions as related to municipalization; and Prof. Frank J. Goodnow and Mr. Walter L. Fisher, President of the Municipal Voters League of Chicago, on political conditions in the cities of the United States and Great Britain as they bear upon the question of municipal ownership.

Space does not permit extended treatment of these articles, all of which are prepared on the bi-partisan plan and all of which contain indirectly much that is instructive and useful. It is interesting, for instance, to note that when Mr. Clark asserts that the service of the British municipal tramways is inferior to the average street car service in the United States conducted by private enterprise, Prof. Parsons's best answer is that conditions here and abroad are essentially different. But it is impossible to pursue at length these comparisons, however instructive they may be

It is necessary to conclude, with brief comment upon a quotation from the review of Prof. John R. Common who writes (on the municipal ownership "side") in relation to labor and politics as affecting municipal enterprises. His view is that under public ownership and operation the recognition of labor organizations would prove a safe-guard. Without stopping to comment on that, the quotation, which is intended as a defense of the charge that there is too much "politics" in the municipal gas enterprise of Wheeling, West Virginia, is appended:

"The secretary of the Wheeling Gas Trustees, quoted by my colleague as testifying to the political rottenness of the municipal gas works, is the same man who testified to the political rottenthe power municipal ownership gives the politicians, constitute one of the chief reasons why the extension of municipal activities is viewed with alarm by conservative men. And besides, Prof. Parsons does not explain why the public ownership of the gas ness of the private gas, electricity and street car companies of that

locality. Instead of relying upon his statements, I interviewed a large number of officials, politicians, business men, employees and others, and checked his statements respecting both the gas works and the corporations. This shows that while the gas works are in politics, the public-service corporations are also in politics. The gas employees take part in the primaries of the Republican party and the motormen and conductors of the street car companies are given leave of absence on pay to work in the primaries of both the Republican and Democratic parties. Even the officers of the street railway employees' union take part in this kind of traction politics on behalf of their employees. The councilmen and aldermen nominated and elected in this way control the municipal gas works and they control the franchises and contracts of the private companies. The 'City Hall Ring' is just as much a ring of the political tools of the private corporations as it is the ring of municipal politicians. To pick out the politics of the gas works and not to see that it is bound up with the politics of the private corporations would be a perverse and one-sided method of investigation. The report gives no selected facts, but all of the facts in the situation. Indeed, the secretary of the Wheeling Gas Trustees, in his indignation toward the political management of the gas works, referred to by my colleague, was defeated in the Republican primaries by the motormen and conductors of the street car company on leave of absence as political workers."

Doubtless this is a valid tu quoque. But does not Prof. Common inadvertently prove too much? Is his description of conditions at Wheeling likely to inspire such enthusiasm as will lead to the extension of public activities in other municipalities where exactly the same conditions obtain or may be induced? The warning in the official summing up of the Commission is recalled. The people, it says, "must also remember that municipal ownership will create a large class of employees who may have more or less political influence." In the light of Prof. Common's description of conditions at Wheeling, this admonition, in its very mildness, has an ominous sound.

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STONE & WEBSTER'S LABORATORY

BY L. B. BUCHANAN

Shortly after beginning business under the name of the Massachusetts Electrical Engineering Company, Stone & Webster established a laboratory.

Up to about 1894, the work done was almost exclusively electrical, and consisted for the most part of electrical testing for clients at large, and in connection with the engineering work then in progress, managed by the firm. During this period some experimental work was done which brought forth a line of electrical instruments, of which the chief one was a galvanometer designed by Professor Holman, which proved to be, at that time, a very successful instrument. With the advent of the D'Arsonval galvanometer and owing to the fact that the Thompson galvanometers, of which the one mentioned was a modification, were extremely sensitive to jars and extraneous electrical disturbances, the demand for such an instrument became extremely limited and its manufacture was discontinued. There was also brought out an electric switch for street car lines, which has not been actively followed up, but whose principles are in practical use today in the switches manufactured by other parties licensed under the original patents. Work in the interest of clients brought forth many successful devices and materials, principal among which were the Shawmut tested fuse wire and fuse links, whose reputation and use at the present time is extensive, and several of the insulating compounds of the Massachusetts Chemical Company.

The chief work of the laboratory was all the testing of electrical materials for the Underwriters' Union. Standard tests were evolved for switches, cutouts, fuses, insulating joints, paints, porcelain fittings, lamps, meters, and in fact everything that was mentioned in the Underwriters' book of rules. When the Underwriters established their own laboratories, somewhere about 1895, the Stone & Webster laboratory gave up to a great extent commercial testing and simply carried on such work as was required in connection with the engineering of the firm, which had then grown to large proportions. Complete installation tests were made at the Bradford Power Station, the Exchange Club, Boston Fire Headquarters, Dedham Court House, Brockton Power Station, S. D. Warren & Company's Plant, New Hampshire State Library, Suncook Mills, Newton Pumping Station, the State House, Morse Twist Drill Company, Westboro Insane Hospital and Quincy Market Cold Storage Plant, and at many other places of less importance. bration of instruments, adjusting of wattmeters, trouble hunting on generators, motors, and cable installations, kept several men The investigations of electrolysis of the water pipes in Boston and Newton, Mass., and Peoria, Ill., were works of considerable magnitude. The first work of this kind was done in this city, and Mr. Robinson and the writer can undoubtedly lay just claim to being the original electrolytic fishermen, who, armed with jointed bamboo poles fitted with reel and wire, operated in the hydrants and track-bounded mud puddles of Boston, instead of "mother's pail," as related in the well-known nursery rhyme.

The instruments available twelve years ago for work of the kind described in the foregoing paragraphs were with few exceptions crude compared with those of the present day. Measurements of energy in alternating circuits were made with some misgivings on the part of the operator, for no one was entirely sure that the indications were truthful records of the actual energy, particularly when two or three phase current was used. Many indirect methods, such as those based on the calorimeter and hot wire voltmeter, were resorted to, to check results, and were often productive of a frame of mind in the operator which was comparable with that coincident with testing underground cables with a Thompson galvanometer in the Back Bay, between an electric car track and a road building establishment, the delights of which latter performance at least one of our engineers has not forgotten.

In 1896 the electrical laboratory was discontinued as a distinct department, but shortly afterward a chemical laboratory was equipped, some of the men of the old testing department were

transferred to the new field, and some of the results of the work therein undertaken are the subject of another article.

The following college and technical school men have been connected with the laboratory at some time in its history:

Charles A. Stone, M. I. T.

Edwin S. Webster, M. I. T.

Russell Robb, M. I. T.

Henry G. Bradlee, M. I. T.

Hollis French, M. I. T.

Francis R. Hart, M. I. T.

Laurence J. Webster, M. I. T.

James W. Cartwright, M. I. T.

Ralph Vose, M. I. T.

T. Whitney Blake, Yale.

Howard L. Rogers, M. I. T.

Howard C. Forbes, M. I. T.

Charles F. Wallace, M. I. T.

Dwight P. Robinson, M. I. T. and Harvard.

Charles Garrison, M. I. T. and Harvard.

Leonard B. Buchanan, M. I. T.

John W. Soars, W. P. I.

Fred'k S. Pratt, Harvard.

Howard S. Reynolds, M. I. T.

Dr. T. A. Mighill, Amherst & Gottingen.

James M. Mackaye, Harvard.

Benj. K. Hough, Cornell.

Franklin N. Conant, M. I. T.

Charles E. Baldwin, Harvard.

S. Everard Williams, Harvard.

R. O. Dalton, Harvard.

Karl Burroughs, M. I. T.

Austin T. Hyde, M. I. T.

W. H. Whitcomb, M. I. T.

R. A. Witherspoon, Rochester University.

STONE AND WEBSTER IN THE FIELD OF ELECTRO CHEMISTRY

BY L. B. BUCHANAN.

Knowledge of electro chemistry may be considered to have begun with Galvani and Volta. Davy, Faraday and Bunsen gave the subject a great deal of attention, and it has subsequently received careful consideration and material advancement at the hands of the great physicists of the last fifty years. While in some directions practical development followed fairly rapidly the results achieved in the research laboratory,—notably in primary batteries and electroplating,—application to the production of chemicals on more than a laboratory scale proceeded slowly and did not attain any magnitude until the dynamo became the well established primary source of electric energy.

Nevertheless, it cannot be said to be the fault of the chemical engineers, because as early as in 1853, or thereabouts, Charles Watt patented in England electrolytic methods for production of chlorine and soda, chlorates, etc., and other kindred methods that completely anticipated the basic principles of many of those which did not come into use until forty years or more later. To a certain extent Watt may be said to have had a lot of "paper patents," but if he had also had a full sized dynamo driven by a Puyallup or an Androscoggin, and had done exactly what he described in his patents, he would have been able to make the products he claimed at figures that would have troubled the old line manufacturing chemists not a little.

The decomposition of common salt for the production of chlorine and bleaching powder, together with caustic soda, attracted the early attention of the latter-day electro chemists, and without intending any injustice to others who may have entered the practical field earlier than those who will be mentioned here, it may

be said that Messrs. S. D. Warren & Company, whose early electrical transmission plant was a subject of Mr. Robb's interesting article in the July issue, were likewise up-to-date and progressive in their chemical department, and after experimenting for a time with the Hermite hypochlorite process (an electrolytic process developed a short time previously in Europe) they undertook the practical development of a salt decomposition cell, with the assistance of Professor Henry Carmichael of Boston. They were successful and have long used the process at their mill at Cumberland Mills, Maine.

As long ago as in 1893, Messrs. Stone & Webster were employed to test and report on the efficiency of this process; but with the exception of occasional work for that firm, they did not devote themselves particularly to electro chemical work until 1896, when the Jacques Carbon Electric Generator was brought out.

As engineers for those interested, it did not take them long to demonstrate the failure of the Jacques potash pot as a primary source of electricity by the use of coal, and to sound the knell of that interesting and deceptive *ignis fatuus*. With a laboratory well equipped it was in order for the firm to continue research along chemical lines, and after devoting some attention to the utilization of ozone and a glass diaphram chlorine cell, the problem of producing chlorates was taken up in 1898, with the result that in the fall of 1899 a plant capable of making one ton of chlorate of potash per day was built at Rumford Falls, Maine.

After experiencing the difficulties incident to the establishment of a totally new business, the plant was enlarged in 1901 and 1902, and by virtue of improvement in efficiency is now able to turn out more than two tons per day, which finds a ready market in this country; and it is safe to say that many of the employees of Stone & Webster are wearing fast black cotton apparel, are lighting their cigars with snap matches, and have celebrated the nation's birthday with fireworks,-all of which articles used some of the chlorate of potash made by the Fort Hill Chemical Company. usefulness in each case was due to the three atoms of oxygen which the Androscoggin River by the force of its long fall at Rumford, acting through the medium of the electric current, wrested from a portion of itself and combined with each molecule of muriate of potash brought from Stassfurt, Germany, to make the molecules of chlorate, which after crystallization, the same great power washed. dried and ground.

The plant of the Fort Hill Chemical Company operates two 39 inch (twin) Rodney-Hunt wheels on 50 feet head, governed by a Lombard. The electrical equipment consists of four 140 K. W. 140 volt belted Crocker-Wheeler generators specially wound for electrolytic work. These machines run at full load twenty-four hours each day, seven days in the week. While the output of the plant is considerable, being approximately one-sixth of the total consumption of chlorate in the United States, the number of employees is small, as is usually the case where electricity does the work.

Following the development of the so-called wet bath processes such as those mentioned previously, came the fused bath and electric furnace methods. To a modest French citizen who very recently died while yet a young man, the world owes more than can be measured by mere figures following a dollar sign. Henri Moissan, chemist, physicist, savant and humanitarian, by his tireless research work, observing and noting the details of his experiments with a care that equalled, if not exceeded, that of that earlier natural philosopher, Count Rumford, has left a paved way with many friendly guide-boards which will be ever travelled by lesser lights of high temperature research, and will lead toward the goal of advanced civilization.

Stone & Webster first became interested in electric furnace work in 1899, when the inventions of the Ampere Electrochemical Company, consisting of several furnace processes, which were in the laboratory stage, were brought to their attention. Among these was one which covered the manufacture of artificial emery or alundum from bauxite. This was taken over by the firm and was commercially developed at the works of the Fort Hill Chemical Company at Rumford Falls. The value of the process was at once recognized by the Norton Company of Worcester. They became the sole licensees under the patents which are now owned by the General Electrochemical Company, and at present operate a large plant at Niagara Falls, making all the abrasive material used in the manufacture of their grinding wheels, which have a world-wide reputation.

There is at present maintained by Stone & Webster a research laboratory which is continuously employed in investigating new chemical processes, and while quite a few have been brought to a point beyond which operations on a laboratory scale will yield no further result, none beside those herein mentioned have been actually launched as commercial enterprises.

While their success in this line is not so generally known as is their success and consequent prestige in the great field of public service enterprise, it is nevertheless a fact that the hand of Stone & Webster has been felt in the arena of chemical industry, and their two successful companies bear witness thereto.

THE NEW STONE & WEBSTER BUILDING

Owing to the necessity for increased floor space for Stone & Webster and for the Stone & Webster Engineering Corporation, the Engineering Corporation recently purchased a modern, eight story fireproof office building in Boston at No. 147 Milk Street, the corner of Batterymarch.

The four lower floors of the building will be occupied by Stone & Webster as soon as it is possible to make the necessary alterations.

The Engineering Corporation have occupied, since August 19, the fifth, sixth, seventh and eighth floors of the building as follows:

The Executive Offices, the Construction Department and the Accounting Department, with the necessary stenographers, and the Directors' Room on the fifth floor.

The Engineering Department, exclusive of the Drafting Room, will occupy the entire sixth floor, with its own corps of stenographers.

The seventh floor will be partially occupied by the Purchasing Department with its stenographers, the Mailing Department and the blue print room of the Drafting Department, leaving about one-third of the space on this floor for future growth.

The eighth and top floor will be occupied by the Drafting Department, proper space being left for filing of blue prints.

In making this move from its old quarters, on the ninth floor of No. 84 State street, to the new building, the Engineering Corporation has nearly double the actual floor area it had before besides having some space for future growth, and will be greatly benefited by the change.

A very good idea of the new building may be had from the half-tone print on the opposite page and from the typical floor plan on the page following.



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METHOD OF REDUCING COST OF ACCIDENTS

BY EDWARD T. MOORE.

It is the theory of the law in Texas, as elsewhere, that in every case the plaintiff must establish his right to recover against the defendant by a fair preponderance of evidence. In practice, however, when the plaintiff sues a corporation for personal injuries the rule is reversed and strengthened, so that the defendant in such a case is required to prove, beyond a reasonable doubt, a want of negligence. Since we confront this condition as a practical matter, it is very essential in the operation of street railroad systems, that every possible means be used, first, to prevent accidents, and second, when they do happen, as they will, that they be handled promptly and with intelligence, so that when we are brought into court in a personal injury suit the same may be successfully defended.

In order to make a thorough investigation of any claim growing out of an accident, it is very necessary that trainmen get all the information possible at the time the accident happens and promptly furnish same to the Claim Department. It has always been a problem with us to get trainmen to thoroughly appreciate the importance of giving a full and complete report of accidents happening on or about their cars, and a failure on their part to do so has hampered the Claim Department, more or less, in the handling of claims. Even some of our best men seem to take it for granted that they have done their full duty, when reporting accidents, if they secure the names of a few passengers, no matter how many they have on their car; while in many instances they fail to report accidents which they do not deem of sufficient importance to require a report.

With a view of reducing the number of accidents and getting a full and complete report of all accidents happening on our system, no matter how trivial they may seem to the trainmen, a series of lectures were given during the month of June. The men were met in shifts, depending on their hours of labor, and it was arranged to meet each shift twice a week. In order to aid the men to follow what was being said, and also to assist them in remembering what had been said to them, these lectures were printed and a copy put in the hands of each man at the time the lectures were given.

At the beginning of these lectures all motormen and conductors were invited to write papers on the topic "How to Prevent Accidents" from their respective standpoints. A standard uniform was offered to the motorman and to the conductor who should write the best paper. The award was to be based solely on the value of the suggestions made, without regard to penmanship or composition. These papers were all to be handed in not later than June 30, which was the end of the course of lectures. Trainmen were urged to attend all lectures, not only for the benefits to be derived from the discussion of this subject at the several meetings, but also that they might gather information for their papers. The subjects of the lectures were as follows:

- 1. The Prevention of Accidents.
- 2. The Purpose and Necessity of Reporting Accidents.
- 3. What to Report as Accidents.
- 4. Handling Accidents at the Time They Happen.
- Witnesses.

The lectures were opened with a talk by the Manager, in which he complimented the trainmen by saying he believed that Dallas had a higher class of trainmen, as individuals and as citizens, than most of the cities in the United States, but he called their attention to the number of accidents we were having and to what the accidents were costing the Dallas Companies in dollars and cents, pointing out to them the necessity of making an improvement in this matter, and urging their co-operation to the end that Dallas should make the best record of any company in the state.

Following the Manager, the subject was next taken up by Mr. Emerson, Superintendent of Railways, who discussed matters of operation, calling attention to certain rules and the violations thereof, which tended to increase the number of accidents, after which Mr. Walne, Claim Agent, discussed accident reports and the necessity of getting a full and complete report in every instance.

Five lectures, in all, were given. It was thought best to have the attendance at the meetings voluntary, and it was very gratifying to see that the majority of the men took advantage of the opportunity and attended regularly. A few did not attend any of the meetings, and others were more or less irregular. As a result of the work, however, we succeeded in reaching most of the men in our employ through this course of lectures. Papers were also received from more than one-half of the trainmen, and most of the letters showed a great deal of thoughtful study and keen interest in the subject. While we did not receive letters from all of the trainmen, our investigation of the matter shows that most of them at least gave the subject considerable study Many of them prepared letters, but did not send them in, for various reasons.

A committee composed of the Manager, Superintendent and Claim Agent read all the letters carefully, many of which possessed so much merit that it was with some difficulty that they were able to agree upon who were entitled to the prizes; in fact, the contest was so close that it was found advisable to award four uniforms instead of two. This seemed to have a good effect upon the trainmen, generally.

We feel thoroughly satisfied with our experiment. We do not believe it possible, with the amount of time and money expended, in any other way to induce so much individual thought on this subject, as we seem to have thoroughly aroused the interest of the men in this branch of their work. We propose to continue this character of instruction and give the trainmen every possible assistance, eventually weeding out careless and indifferent employees.

A SOUTHERN GAS COMPANY

BY MAC D. DEXTER.

The Stone & Webster interests in Columbus comprise the Columbus Railroad Company, The Columbus Power Company and the Gas Light Company of Columbus.

The latter company was taken over in 1903, and since then has nearly doubled its output of gas. During the ten years previous to 1903 the output had only increased 10 per cent. The gas plant was built by Perdicaris & Hoy in the year of 1852. The son of the senior member of the firm achieved some notoriety by having been captured by brigands in Morocco a year or two ago, and some stock was held by the Perdicaris estate until the transfer in 1903. In early days gas was made from fat lightwood and rosin. One of the old cast iron rosin retorts can be seen at the plant today, where it is humbly serving as a post to prevent teams from driving against one of the holders.

In the early days only the better class of residences and stores used gas, which with street lighting was the sole business of the company. Gas for fuel was unknown, and even after the company made gas from coal all the tar was allowed to flow into the river as waste product, and even coke was considered a drug on the market. It seems that during the war the plant was kept running until it was burned by Wilson's raiders in 1865. However, shortly after this the works were rebuilt and prospered, the price of gas being \$8 per thousand feet at that time.

Among some of the old papers was found an interesting relic of war times in the shape of a day book, from which one would judge that a small iron foundry was run in connection with the gas works. The entries show that money as a means of carrying on trade was almost unknown during the latter part of the war. In August, 1864, John McIlhenny was debited with 23 pounds of ham at \$3 per pound. Just below that entry was

Foundry Acct.	Dr.
1-2 gal. oil	\$13.00
1 1-2 lbs. nails	5.00
and then	
B. Williams,	Dr.
One 14 in. sugar mill delivered this day	\$ 1,125.0 0
B. Williams,	Cr.
By 176 lbs. bacon sides	
By 194 lbs. lard	\$1,1 07.50
By cash	17.50
Total	\$1 125 00
10001	4-,0.00

Coal was \$150 per ton and iron was \$350 per ton. After the war was over the progress of the Gas Company was slow but steady, and in common with most other companies it lost some business, including street lighting, when electricity came into the field. Gas for cooking had been pushed prior to 1903, but the first year Stone & Webster had charge the number of new customers obtained was four times as many as the year previous, a full car load of stoves being sold that year. Last year, three years later, three car loads were disposed of. Prior to 1903 it took 10 years to gain 10 per cent., now each year shows 30 per cent. gain in output.

Columbus is largely a manufacturing city, and especial efforts are being made to introduce gas to the artisan and cotton mill operatives. This class in the South is a little slow in taking to things new to them, but surely as they are being educated to riding on the street cars they will take the gas to save them work, worry, time and heat.

Cheap pine wood fuel and the negro servant in times past have been the greatest drawback to the general adoption of gas for cooking. Cooking with gas is now taught in public schools, both colored and white. The demand for servants is greater than the willing supply and the price of wood is going steadily upward.

The prepayment gas meter is proving to be a great help in getting new business. Already one-third of the meters in service are of this character. With this meter the wage earner buys gas by the quarters' worth at a time. The Gas Company gets cash without the necessity of making out a gas bill, and the customer

sees and feels that he gets value for his money. The housekeeper with a negro cook uses the prepayment meter to keep check on the servant to prevent waste.

To show the growing business, in 1902 an extension of the mains was made to Rose Hill, with a branch to East Highlands. Four years later, although favorably situated at an elevation of one hundred feet above the gas plant, where the pressure is higher, due to the natural tendency of gas to rise, the mains were so overtaxed that an auxiliary supply line was necessary. This pipe was laid in the fall of 1906 and also an extension made to one of the mill settlements just established, known as Jordan City. Here gas is used for singeing cotton goods in one of the mills, for embossing in a chair factory, and in the operatives houses for cooking purposes.

So far as is known, this is one of the first extensions in the South to a strictly cotton mill district. Another extension was completed early this year to the suburb known as Wynnton, and the majority of the residents became customers at once.

The district at present supplied by the Gas Company comprises the old city, Rose Hill, Wynnton, and a part of East Highlands, the field of Bibb City to the North and Girard and Phenix City in Alabama being still unsupplied. A plan is being considered to reach these districts, together with the growing settlements made possible by the improved street car facilities, which will still further increase the sale of gas.

While the sales of gas per mile of main in the older parts of town are not up to the standard of some other cities, at the present rate of increase Columbus will soon equal or surpass any other city of its size in the South.

THE BLUE HILL STREET RAILWAY COM-PANY DESPATCHER SYSTEM

BY A. H. WALCOTT.

The general direction of our line is north and south, and our despatcher is provided with a despatching sheet, which is fastened to a table to show the car movements north and south and cars working towards each other.

On this sheet is given the distance between turnouts and crossovers, also the running time between turnouts and crossovers, with spaces to be filled out with the car crews, car numbers, time cars leave, delays in leaving, exact time of leaving and the time that the car arrives at each meeting point or calling up point, the time that cars are due to arrive at their terminals, the time they arrive, and delays if any.

If more than one car is run in one section, the number of extra cars is set down in the upper right or left hand corner of the space, as the case may be, to indicate whether extra cars are ahead or behind the regular. When plows are run in the same section with regular car, the letter "P" is used; for service cars, the letter "S." This indicates at all times just how many cars or plows there are in a section and whether they are ahead or behind the regular car.

The sheet also provides for taking the temperature each hour, and what sign is displayed to indicate the point of heat required. Condition of the weather and rail is given every six hours, with the name of the despatcher and the time he comes on and goes off duty.

Spaces are also provided for delays, and remarks in general, so that at the end of the day's run we have a complete record of all car movements during the day.

At all turnouts and intersecting lines and crossovers are placed telephones of Couch & Seeley pattern, and all employees are provided with keys. Before leaving terminal points, the conductor calls up the despatcher, giving his name and the name of his motorman, number of the car, number of the telephone at which he is, and his route and destination. The despatcher then gives him his orders, which the conductor repeats back to the despatcher, word for word, and if correct despatcher answers O. K. If not correct, the despatcher so states and proceeds to give orders again. Upon receiving the despatcher's O. K. conductor repeats orders to motorman, who repeats them back to conductor and receives his O. K., the motorman not being allowed to start his car until he has received O. K. from the conductor. The same rule applying to all points along the line.

Employees calling up are required to take down the receiver and listen, and if the line is not clear wait until it is so before calling, except in case of emergency, when they may call despatcher, calling for a clearance on the line, stating an emergency case.

We are experimenting with double telephones. We are connecting to our 'phones hand micro telephones, and under this system the conductor and the motorman both proceed to the telephone, the conductor calling up the despatcher and upon receiving notice that his call is answered he proceeds in the usual manner, the motorman listening through his own receiver. When the conductor has repeated his orders back to the despatcher and received his O. K., the motorman then repeats orders, as he has received them, to despatcher. If correct, he is answered by despatcher as complete. In this way there should be no misunderstanding of orders, as both conductor and motorman have received the orders from the despatcher and repeated them back to him and received his approval.

All turnouts, crossovers and junction points are numbered to correspond with the telephone number.

To protect our employees against shocks in using telephones, we have placed at all pole boxes a platform made of 2-in. planks cleated together. Four (4) pole pins are placed near each corner and on these pins are screwed the ordinary glass insulators. These platforms are set with the insulators on the ground and have proved a great safeguard against shocks.

In addition to our despatcher system we also have all of the single track portion of our main line, and also the section on the Norwood division from the car house to the main line, equipped with automatic block signals. We have thirteen blocks now in use

on the line, a large part of which have been in operation over three years.

These signals are especially designed for use on single track trolley roads, to govern traffic in both directions. They are entirely automatic in operation, being controlled in their action by the trolley wheels of cars acting on contact devices secured to trolley wire.

Two trolley switches and two signal boxes are required for a set or block of signals, and this apparatus serves to govern traffic on a section of track between any two predetermined points, such as two adjacent turnouts or intersecting lines. The two signal boxes at opposite ends of a section are connected by two line wires, and for this purpose we have used No. 10 galvanized iron wire.

The usual signal is a metal target about 8 in. in diameter and painted red. This target is placed underneath the signal case, and so is completely protected from the weather. Two 5-in. semaphore lenses, one red and the other green, serve as auxiliary and night signals. There is an ordinary 16 c. p. lamp back of each lens, and the lamps at each signal box are in local circuits and not connected with any of the rest of operating circuits, so that the burning out of lamps does not affect operation of signal.

These signals are made so as to allow several cars, travelling of course in the same direction, in a section at the same time, and each car before it enters gets a positive signal.

The signals are given to motormen as follows:

The normal position is with the red target displayed and neither lamp lighted, indicating no car in the section going in either drection.

The red target displayed and the red lamp lighted indicate that a car is approaching from other end of section.

As a car, in entering an unoccupied section, passes trolley switch, the red target turns so as to present its edge, the red lamp lights for a few seconds, then goes out, and the green lamp lights. This gives a car the right to enter and proceed through section.

A second car following first car into the section sees the target edge on and green lamp lighted, this notifying that a car precedes it in section and so serving as a protection against a rear end collision. As it passes trolley switch the green lamp goes out and the red lamp lights up for a few seconds and then goes out and the green lamp lights again. This change gives the car the right to go ahead through section.

When a number of cars have so entered a section, the same number must pass out at other end of section before signals will return to normal positions again.

When several cars are in a section, if car leaves at leaving end at the same time another car enters at entering end, the mechanism will operate correctly. If cars try to enter opposite ends of an unoccupied section simultaneously, signals will clear at one end to allow one car to enter and go to danger at other end, thus "blocking" that car from entering.

When signal has been set to allow passage of car or cars in one direction through section, the mechanism is locked at entering end and circuits broken in signal boxes at both ends of section to prevent any interference with or change of signals so set until the last car leaves section, when they return to normal.

These signals have been generally satisfactory, although we have had some trouble with them. Some of this was at first doubtless due to our not understanding them and the proper way to take care of them. We also have had considerable trouble due to lightning burning out resistance units. This has been largely overcome by placing lightning arresters near each signal box and using a special lightning protection device furnished by the Electric Railway Signal Company and also by using a different type of resistance and placing same in wooden boxes separate from rest of mechanism and fusing line wires. Apart from minor things the balance troubles have been caused by the trolley switch. This switch is provided with two contacts and so constructed that a trolley wheel of a car passing in one direction will close one of these contacts and wheel passing in other direction will close other contact. The closure of these circuits so made is prolonged after the trolley wheel disengages switch by the action of an air dash-pot in switch.

The presence of dust or dirt in the valve of dash-pot at times prevents the prolonging of contact sufficiently to operate signal mechanism. We are replacing these dash-pots by an escapement device furnished by the signal company, and find that this practically eliminates trouble from this source.

We are also, with good results, removing the target and replacing it with a 12-in. semaphore arm. This arm stands normally in a horizontal position and is moved, when a car passes trolley switch in entering a section, about 70 degrees towards a vertical position.

Where the target is used it turns edge on so as not to be visible to a motorman when signal clears to allow car to enter block, but the new arm is always in plain sight and the motorman must see it in its lowered position before proceeding. By the use of this arm, the wear on the mechanism is much less than when the turning target is used, as it works much more freely.

The despatcher in giving orders instructs the crews to proceed with right of way signals to point designated. In this way if any misunderstanding should occur they would be held up by signals, when the crew would call up despatcher for orders.

STONE & WEBSTER IN THE TROPICS

BY F. J. HOVEY.

With the establishment by Congress of Civil Government in Porto Rico came a demand for modern facilities in the way of electric lighting and transportation.

At this time there were in the Island, at San Juan and Ponce, steam dummy lines which were operated under franchises from the old Spanish Government and which were obsolete and unsatisfactory. In both of these cities, as also in Mayaguez, there were lighting companies with machinery and equipment of old type, and, in the last named city, a horse railroad of antiquated pattern.

The first electrification of street railways was by J. G. White & Company, in San Juan, utilizing the old steam dummy tracks between the city proper and the suburb of San Turce.

A lighting system was also constructed and has since been consolidated with the native plant. Railway extensions are being made to Caguas, a distance of 22 miles. A water power on the Comerio River is being developed, and will be brought into the city over a transmission line, about 20 miles in length.

In 1901 Stone & Webster became interested in the building of a street railway and lighting plant in Ponce, the second city in the island, of about 35,000 inhabitants, lying three and a half miles back from the Playa, or Port, this site having been, it is said, selected by the founders of the city that the merchants might have their homes at some distance from the shore and be secure from the visits of pirates, who, at that time, infested the Caribbean Sea.

The entire wholesale business is done at the Playa, and all storage and shipping warehouses are situated there.

The main road, connecting the city and the port, presents a busy scene, a constant stream of traffic flowing in both directions. A street railway was therefore built to connect the city with the port, and a loop constructed within the city limits, skirting the two

principal squares and passing the Casino, the post office and other important points. The opening of this road was the signal for the abandonment of the old cab system, which was totally inadequate to handle the traffic, and passengers are now carried with ease and comfort at less than half the former price in about one-third of the time.

Shortly after the road was opened there was a period of depression in the sugar industry from low prices prevailing, and the coffee crop was also difficult to dispose of, owing to very high rates of duty imposed by foreign countries after the American occupation. For several years past these conditions have materially improved and are reflected in the amount of business done by merchants, shippers, and others, in Ponce. Under Spanish rule, the trade balance against the island was nearly \$13,000,000, while the balance of trade in favor of the island since the occupation is \$2,500,000. Exports and imports have increased from \$25,000,000 to \$44,000,000, while the appraised value of real property in the island has risen from \$30,000,000 to \$100,000,000. To one who has visited the Island constantly for the last five years the improvement in general business is very noticeable.

The population of the Island is dense for its area, and in Spanish times and during the first year or two of the American occupation many a poor laborer could not get employment and was obliged to subsist on wild fruits and live as best he could. At that time any number of men could be found who were glad to work for almost any sum. Today, everybody can find employment, either on a sugar plantation, in the mills, in the coffee districts, or, last but not least, in the tobacco fields in the centre of the Island. The American Tobacco Company has invested large amounts of capital, adopted the most modern methods of cultivating, curing, packing and shipping, and the result is that where native growers formerly employed a few hands the so-called "Trust" has given employment to thousands and is carrying on an up-to-date business in a way that is delightful to contemplate.

The sugar industry which is, and probably always will be, by far the largest in the Island, has proceeded along the same lines. A very large amount of capital has been invested by leading financiers in the United States and the entire system of making sugar has been revolutionized. Formerly the hills and valleys were dotted with small sugar mills which ground the cane in a very wasteful way and shipped their sugar to commission merchants in

the large towns, a few bags at a time. Rarely has there been seen a similar example of economic waste, and the change that has taken place is very great. Large "Centrales" have been established at convenient shipping points in the centre of the sugar districts and railroads built to carry the cane directly from the field to the mill, insuring continual operation and a far better product than formerly.

In this line, Porto Rico has the advantage over the other Islands in the Caribbean Sea of not paying any duty on the sugar shipped to the States. The soil is of the best, and although on the south side of the Island droughts occasionally curtail the size of the crop, a very fine system of irrigation exists and is being constantly extended.

The result of all these increases in activity is that Porto Rico now stands on a firm footing, and the Stone & Webster property in Ponce has passed the condition of experiment and is now an assured success. With the growth of the railway the lighting and power business has also been developed and since the consolidation with the native company, which was effected in 1904, the growth of this department has been remarkably rapid. On the lighting side the summer and winter peaks are not as noticeable as with us, for the reason that there is not very much difference in the length of the days between the two seasons.

The Porto Ricans are very proud of their city lighting and use it to the best advantage in illuminating their squares and public places. Furthermore, it is considered a mark of respectability to use electric light, and many a shack containing a large family and which costs not over \$15.00 to build is lighted by an electric lamp at a cost of \$1.00 per month.

Power is sold to many small industries, such as coffee mills, fruit shippers, small pumping plants and various other installations where the use of isolated plants would be inconvenient and cumbersome. It is probable that the use of power for irrigation purposes will be very largely extended. The growth of the business may be seen from the following table:

GROSS EARNINGS.

1903	 \$47,339.14
1904	 73,744.55
1905	 88,573.80
1906	 107.264.86

For 1907, the five months to June 1 show an increase of over 19 per cent.

In the early history of the enterprise it was clearly seen that it would be necessary, owing to the high price of coal and the expense of making repairs at such a distance from modern machine shops, to study very carefully the matter of expense, and after construction was completed it was decided to operate Ponce on what may be called a "student" basis. Following out their general policy of sending young technical and college graduates to the various companies, Stone & Webster have for the past four or five years filled all the official positions with men of this special training.

George C. Towle, who was the engineer in charge of construction, remained only two months time after the opening of the road and was succeeded by Horatio Bigelow, who remained as manager. He was followed by David Daly, a graduate of Harvard, 1901, who had gone down as a student and by this time had charge of the railway operation. Mr. Daly is now manager at Houston, Texas. He was succeeded by Marcy L. Sperry, of the Institute of Technology, who had been in Ponce for some little time as assistant treasurer, and after leaving Ponce went to The Minneapolis General Electric Company as Superintendent. Following him came Gardner Rogers, also an Institute graduate, who has recently taken Mr. Sperry's place at Minneapolis, the latter having been promoted to the position of manager at Savannah. Thomas Nickerson, who was formerly assistant treasurer at Ponce, is now manager at Woonsocket, Rhode Island. Mr. Rogers was succeeded by Herbert S. Whiton of the Lawrence Scientific School, who went to Ponce some three years ago as engineer in the power station. He is now manager of the company.

The present list of local officers is as follows:

Manager	
Superintendent of Lighting	E. B. Cooper
Assistant Superintendent of Li	ghtingEdward T. Steel
Superintendent of Railway	Walter P. Ingham.
Chief Engineer	Jefferson Alexander
Assistant Treasurer	James B. Walker
Bookkeeper and Cashier	N. J. Waters

These young men together occupy a house in the immediate vicinity of the office and power plant, and one of their number is assigned to the duties of housekeeping. During Mr. Daly's in-

cumbency certain questions arose as to the management of servants, the employment of cooks, etc., but, with better knowledge of what is required, has come a smoothness of operation which can only be acquired by experience. Certainly one visiting the house today finds comforts and even luxuries which were unknown to the early settler. The advantage of thus living together is apparent, as the men in all departments confer freely with each other, and when any question arises thrash it out among themselves and decide what it is better to do. The necessity for this arises from the fact that it requires seventeen days to get an answer by mail from the Boston office and that cables cost seventy-five cents a word; furthermore, the spirit of good fellowship which such living promotes is very apparent and much for the interest of the company.

TWO INTERESTING PIECES OF WORK

BY E. J. EMERSON.

The street railway companies of Dallas are just completing two good sized jobs in paving and track construction, which, while both of the concrete stringer type, differ somewhat from each other, as well as from the type of construction used in other cities, and it might be of interest to note the difference in these pages.

In the construction of our Ervay street line, which is just being finished, no wooden cross ties were employed, but in addition to the customary round tie rod midway between the base and the top of the rail, a tie bar was clamped to the base of the rail at points equi-distant from the round rods. The ties or rods of each set were placed 10 ft. apart. The upper round rods were 3-4 in. in diameter, and were bolted through the rails in the usual manner. The lower tie bars were 1-2 x 1 1-2 in. bar iron, extending under the rails and fastened in a vertical position by a special clamp on each side of each rail.

Nine in. 95-lb. 60 ft. length groove girder rail was used, these being bolted together with eight bolt continuous rail joints and electrically connected by two 4/0 American Steel Company's plug bonds; while at the steam railway crossings, the connection was made through old 75-lb. Tee rail, laid under the crossing, and connected on either side to our rails by long bonds.

This work being of double track construction, the city compelled us to have our outside rail of each track 1-2 in. lower than the inside rails, and no super-elevation was allowed on the outside rails of curves.

Before any of the rail work was laid, trenches to receive the concrete stringers were excavated, and the rail, after being laid in and bolted together, was suspended and surfaced on wooden blocks over the trenches, for several hundred feet ahead of the concrete gang.

The concrete stringer proper under each rail, was 18 in. wide x 13 in. high, one inch of which came above the base of the rail, all forming an integral part of the 6 in. concrete base for the bitulithic paving, which concrete base was placed between the rails and the track, and to the street curb line.

The concrete was composed of one part Portland cement, three parts sand and six parts broken lime stone of graded sizes, not more than 2 1-2 in. or less than 1-2 in. in size. A portable steam operated continuous mixer was used for this work.

In putting in the concrete stringer, space was left around the blocks and wedges, supporting the rails, and after the concrete had set, the blocks were removed and the holes left by them filled in.

The concrete was allowed to set seven days before cars were permitted to run on the tracks.

The street was finished with a two-inch layer of bitulithic pavement, which was carried up to the rails without the use of paving blocks or bricks.

The paving and concrete work was done under contract by the Texas Bitulithic Company. The track work was done by Stone & Webster Engineering Corporation, all of the construction being under our supervision.

Our Forest Ave. track while of the concrete stringer type of construction, differs somewhat from Ervay street work, in that we used in connection with the 3-4 in. round tie rod, at 10 ft. centers, a 6 in. x 8 in. x 7 ft. heart pine tie, treated with carbolineum, instead of the 1-2 in. x 1 1-2 in. iron bar ties.

The rail used was the same as that used on Ervay street, a 95-lb. 9 in. groove girder rail, which was connected by the same style continuous joints and electrically connected in the same manner as the Ervay street work.

The pine ties were placed four foot centers, and after the trenches were dug and the track laid in place, we found that by simply tamping the center and end of ties the track could be held to line and surface in this manner, without using blocks, as in Ervay street construction.

The trenches for the concrete beam under each rail were dug 18 in. wide and 15 in. deep. This gave 8 in. under the ties, 14 in. under the rail (where there were no ties) and one inch above the base of the rail, this latter being made necessary to meet the 6 in. base for the paving. The upper inside corners of the trenches were shaved off six inches, in order that an arch might be formed by the concrete stringers and the 6 in. pavement base.

The proportion for the concrete, as well as the system of mixing, was the same as that used in our Ervay street work.

The finishing surface was also the same as that used on Ervay street, being 2 in. of bitulithic pavement.

The paving and concrete work was done under contract by the Texas Bitulithic Company. The track work was done by our own construction gang.

GROWTH

BY R. A. PHILIP.

Growth is vital to the electric service business. Electrical equipment cannot be purchased with the expectation of using it until it fails from the decay of time or the wear of use. Time and use are slow, but advance in the art is rapid, so each machine while yet in its prime becomes obsolete.

The old machine is obsolete because a new one can do the work enough cheaper to pay the fixed charges on its cost and leave a little margin besides. One advance in the art follows another, each new machine is replaced by one still newer. Each successive improvement cuts a slice from the operating expenses and adds one to the fixed charges, until it becomes evident even to those outside that the cost of the service is largely fixed charges and that the greater part of the fixed charges represents capital which was invested in equipment since discarded. Conditions are then ripe for a new company to come into the field without this disadvantage and furnish service at a less price and with a greater profit.

Against this fatal outcome the company already in the field has one weapon which is sufficient if used in time,—growth. Each improvement of the art broadens the field of usefulness of the electric current, one increases the economical radius of distribution, another increases the economical size of units, and a third adapts the same current to light and power. If the electric service company grows as its field enlarges, it will discard its old apparatus because it is outgrown as well as obsolete, and the new equipment will have two margins of economy instead of one.

The second economy due to increased size of business may be expected to pay the fixed charges on the discarded equipment and give a margin besides, because the economy is obtained on the whole of the larger plant, while the fixed charges represent only the original portion.

The established company is now in a position to carry along the charges on its former equipment and still furnish service at a profit cheaper than a smaller competitor can afford. Further, there is no undeveloped business to tempt a competitor. No rival can at once secure sufficient business to obtain the economy which pertains to large size, nor can any grow to sufficient size without itself passing through the same development stages, and therefore having equivalent fixed charges for discarded apparatus.

Until the end in the advance of the art is reached, the vitality of an electric service business depends on its growth; every improvement will weaken it if it does not take advantage of the opportunities to grow.

Some Practical Features

A "WONDERFUL" METER.

BY J. C. WOODSOME, Houghton, Mich.

When men of the same class of business get together they usually start to boast. Well, by means of this Journal we companies get together, and to be consistent we are going to boast. We are in the business of selling electricity. We do not guess at the amount furnished our customers, but measure it. We use several types of meters, and if there is anything we pride ourselves on it is the accuracy of these meters. We have a very good equipment of testing instruments and our men know their business. When it comes to adjusting a meter we know enough to eliminate friction, as well as to compensate for induction. We are experts in this work. In fact, we are beginning to believe that we are in a class all by ourselves. Nor is this self esteem altogether the product of our own vanity; it has been forced on us.

From earliest times men have worked on the problem of perpetual motion. Some have developed "remarkable" machines; others have met with signal failure. It now seems that in our efforts to obtain perfect working of our meters we have unconsciously solved the problem.

You may have some doubt of this, and to allay this doubt we quote the following, which was recently received from one of our customers:

"When I called your attention to that you sent a man and changed the meter. When the meter was taken out to have another replaced, the old meter still kept running on the counter two hours after it had been disconnected. I called the man's attention to this, and he thought it was a 'wonderful' thing. As I believe that this has been going on for the past three years, I believe that the company owes me at least \$200. Would like to have you give this matter your immediate attention."

This is the evidence. We do not care to discuss the merit of the evidence, so waive all argument. We told you we were going to boast. We told you we were in a class all by ourselves in meter work. We have submitted proof (?) of this and close the matter here.

It would be interesting, however, to hear from others, if they feel entitled to boast on this or any other subject.

RECORDING STATISTICS.

BY H. F. CUTTER, Fort Worth, Tex.

The method of keeping a record of the statistics of operation of the company at Fort Worth, is much the same as that used at the Boston office. As would naturally be expected, "curve sheets" form the backbone of our system, although some of the data are preserved in columns of figures in the old-fashioned way.

There is one important difference between the statistics of this company as kept in Boston and as kept in Fort Worth. At Boston, all values are the so called "twelve months figures," whereas we find it of more advantage to plot monthly data, since locally it is more important to know the operating details this month as compared with the same month last year, than it is to know our standing this twelve months as compared with the corresponding twelve months of the previous year.

The fact that we operate an Interurban Division opens a prolific field for the statistician. The possibilities of the situation are shown by complete records of the "earnings" and "passengers carried" between stations on various kinds of tickets, and on cash fares. In this connection it may be noted that although the new "anti-pass law" has made some of our carefully compiled records of free transportation practically worthless, we do not feel that we have suffered any severe loss thereby, inasmuch as we are now able to turn hopefully to a comparison of conditions existing during the "ante-anti-pass law" days and at the present time.

TRACK BUILDING AT FORT WORTH.

BY H. M. FLANDERS, Fort Worth, Tex.

During the last twelve months, the Northern Texas Traction Company has built six miles of single track, not including necessary turnouts and the new car barn layout at Oak Cliff. Of this work, 5.4 miles have been built in dirt and gravel streets, and .6 miles in a street paved with asphalt on a concrete foundation.

The track in dirt and gravel streets is of 60 lb. tee rail construction with 6 in. x 8 in. x 8 ft. burnettized pine ties spaced two feet center to center on a 6 in. foundation of gravel. The track in paved street is of 9 in. 95 lb. grooved girder rail construction, on 6 in. x 8 in. x 7 ft. creosoted pine ties spaced four feet center to center, with 7-8 in. round tie rods, spaced five feet center to center embedded in concrete which extends from 6 in. below the bottom of the tie to within two inches of the top of the rail, forming the base for the asphalt pavement.

Within a few days, the work of relaying about nine-tenths of a mile of the Hemphill line with 9 in. girder rail will start, and also about two miles of 60 lb. construction in North Fort Worth. As soon as the necessary rail is received, about two miles of the College Line will also be relaid with 60 lb. tee rail, replacing the 40 lb. rail.

BUILDING UP TRAFFIC.

BY C. L. SYKES, Fort Worth, Tex.

The Passenger Department of the Northern Texas Traction Company continues to feel encouraged over the steady increase of regular traffic, and more especially over the popular demand for "special cars" by private parties, political and religious organizations, lodges, etc.

Great care is taken to give prompt and efficient service and to avoid anything that might tend to mar the pleasure of the trips. The last "special" of particular note was one chartered Sunday, June 23, 1907, by the leading business men of Fort Worth to carry Mr. William Jennings Bryan from Dallas over the Interurban Line to Fort Worth. Mr. Bryan's visit was of no particular significance, as he came under the auspices of the Fort Worth Chautauqua; but his many friends took this occasion to pay their respects. The trip was a success in every particular.

The Northern Texas Traction Company has twenty agents selling tickets on the Interurban Line. The Texas & Pacific Railway Company has used for years past, as a sort of trade-mark on all of their advertising literature, "No trouble to answer questions." The Passenger Department of the Northern Texas Traction Company in its instructions to agents has inculcated the spirit of fur-

nishing information fully and cheerfully. Might it not be a help to adopt as a trade-mark, "Questions your Privilege," "Answering our Delight"? For an agent, we must consider, must not only give the information asked, but should do it in a pleasing manner, thereby making a pleased passenger, the best advertisement the company can have.

SUCCESS IN TRAIN DESPATCHING.

BY A. G. ROSSER, Handley, Tex.

The Northern Texas Traction Company in handling its Interurban Line operates under the American Standard Railway code of rules as nearly as possible. Trainmen stand an examination under this code before they enter the actual service on lines. Our best Interurban trainmen are those having both steam railway and street railway experience. Three dispatchers are employed by the company, working a shift of eight hours apiece, using telephones instead of telegraph for their dispatching. We find that in using telephones we talk directly to the trainmen who are to execute the orders given, and that we have no sidings where we are not able to communicate with trainmen, saving delays and sometimes a tieup. Dispatcher gives the order to the conductor in charge of train, first giving the number of order, then following with the order. Conductor receiving the order repeats the order back as dispatcher sends it, and on completion of order repeats entire order back to dispatcher, dispatcher giving complete and time on same. Conductor then hands order to motorman, who in turn reads order back to conductor before starting his train. We use the standard (31) form of train order, and great care is taken in making all orders as clear and simple as possible. No complicated orders are allowed to be put out. We also have a standard form of clearance card, and on these clearance cards the numbers of all orders for this one train are given. Our time table shows positive meeting points for all time-carded trains. Trains meet as per time table unless otherwise ordered by the dispatcher. We have no right of direction. Trains hold their rights until twelve hours late. We only have two classes of trains time-carded. They are, first and second class. First class trains have the right to proceed, unless otherwise ordered by the dispatcher, against all second class trains. Extra trains have no right except that given by the dispatcher in a 31 train order. We have register books located at terminals and a dispatcher's office, where conductors register their train numbers, car numbers, time in, time out, conductor's name and signals carried from and to, if signals carried. All instructions governing the movement of trains must be given in writing.

We find that in cases of trouble a clear head is the most important successful part about train dispatching.

Dispatchers giving orders and trainmen receiving and executing them, should not become worried or angry in any way at each other. This sometimes is the cause of our most serious accidents, and can be avoided by kind treatment on the part of the train dispatcher in giving trainmen what they want as long as he can keep both sides in the clear. When he gets off duty he can then show them where they were wrong. Besides, in cases of trouble we have use for telephones in giving orders and no time for arguments. A successful train dispatcher should leave his temper at home and should be an artist in keeping mankind in a good humor, attending to business, and smiling at everyone. Be sure you are right and then go ahead.

My experience as a train dispatcher has been that one can do more after the situation presents itself. Train dispatching is a serious proposition and should be given as much notice as possible.

KEEPING DOWN EXPENSES.

BY H. T. EDGAR, Fort Worth, Tex.

The Northern Texas Traction Company has adopted a bogie for the year 1907, and efforts are being made to keep the company's earnings and expenses as near the bogie as possible. In order to accomplish this, a daily expense sheet for each amount is kept each month. A few days before the first of the month the management notifies the head of each department how much money he can spend in his department for the month.

A clerk is specially employed to keep this record of expenses. He keeps a separate sheet for each expense, the sheet having upon it either thirty or thirty-one lines, each line indicating a day of the month. The expense of each account is divided into two items, labor and material, and the expense incurred by each department for each account for each day is kept on this sheet. In this way the manager is enabled to see each day just how his expenses are running and to check or cut out any expenses that are running over the bogie. Of course it is not always possible to cut expenses, even

though they are running over the bogie, but a great many times this can be done and the expense put off into the following month.

In this way, the manager knows practically what his expenses are going to be for the month, and it affords him a very much better opportunity of keeping the expenses within the bogie.

THE CLAIM DEPARTMENT.

BY W. C. FORBESS, Fort Worth, Tex.

The Claim Department of a transportation company, whether steam or electric, is an important department in the organization of such company; and yet it produces no revenue, but on the contrary constantly drains on the treasury of the corporation.

The Claim Department not only has to deal with the public in general, but also has to be in close touch with its operatives. The Claim Agent is a trouble adjuster for the company, and it is largely his tact and disposition which make his services valuable to the company. He must, as far as possible, keep the company out of litigation; yet he must have the courage and backbone to turn down all unjust claims when a thorough investigation has developed that the company is not liable. At the same time, in rendering his decision he should use sufficient diplomacy and policy in his manner toward the claimant as not to incur enmity toward the company. This usually can be accomplished by a thorough discussion of the facts surrounding the accident with the claimant, at the same time telling him what the disinterested witnesses say regarding it.

It is to the Claim Department that a great many irregularities other than claims are referred, such as the passing up of prospective passengers, delay of cars, letting passengers off at improper places, and a great many other complaints of like nature. It is in such cases that the Claim Agent has an opportunity of making a friend or an enemy for the company, the same depending largely upon the attention he gives to the complainant; usually a satisfactory explanation can be made as to the possible cause of the complaint, with the promise to give the matter further investigation that will satisfy the party making the same.

MOTORS AND ARMATURES.

BY T. N. HARTIN, Fort Worth, Tex.

In putting motors on cars, we have noticed on different types that unless care is taken in tightening the pinions they get loose

very easily. Shopmen should always bear this in mind, as the pinions and gear wheels are at the mercy of the motormen, and are used in the place of brakes many times each month; we therefore find it best in putting on gears and pinions to be extremely careful in tightening up the bolts.

The night inspector cannot be too careful in gauging his armatures in order that they may never be allowed to touch the pole pieces. It is a mistake for a shop foreman to try and get too much wear out of bearings, as he is likely to allow them to run too long, and the consequences are that the armature gets down on the pole pieces, knocks the band off the armature, and perhaps burns it out.

We find it better, however, not to allow the armature to get too close to the pole pieces before putting in new bearings. We have in operation 275 armatures, and our armature winder does not have enough work to keep him busy constantly winding armatures, and spends some of his time in the pit working on cars.

THE VALUE OF THE PRICE LIST.

BY W. L. WESTON, Fort Worth, Tex.

One of a Purchasing Agent's principal duties is the maintenance of an accurate price list. It requires very little time, and its advantages greatly outweigh any trouble entailed.

Each article purchased, without exception, should have its price recorded on a card, and that card filed alphabetically in a filing cabinet. By this method, and this method alone, can a Purchasing Agent check prices with any degree of accuracy. Without some such record it is impossible to determine just what firm is giving the best prices on a certain article. For example:

A requisition for material is received by the Purchasing Agent; he immediately refers to his price list, and from it is able to determine what firm will give the best price, and will place the order accordingly.

This record becomes invaluable when estimates are being made for construction work of any nature.

Take the form used for a price card by the Purchasing Department of the Northern Texas Traction Company. The name of the article is entered at the top of the card. In doing this, one must be careful not to use any vague or ambiguous name, such as "pinions," but should put "pinions for G. E. 81 motor," or some such specific description of the article.

The columns on the card readily explain themselves. Under the heading "remarks" could be inserted a brief statement of results obtained from the article, or other useful information. An extra column for "freight" should be added and would be found very valuable.

This system works admirably, and although it has been installed but a short time, we feel we are amply repaid for the time and labor spent in introducing it.

WIRING FOR LIGHTS.

BY E. E. NELSON, Fort Worth Tex.

The Electrical Department has just finished wiring for lights the new theatre and dancing pavilion at Lake Erie Park.

The lighting of this pavilion is done by 25-cycle, 100 volt current. We have used this kind of current because our Power House at Lake Erie generates three-phase, 25 cycle, 400 volt current. This 400 volts is stepped down to 100 volts by means of four to one transformers placed on poles outside of the pavilion. The pavilion is lighted with 287 sixteen candle power and 620 four candle power incandescent lamps.

The flicker of the lamps due to the low frequency used, is not noticeable in the sixteen candle power lamps, while the flicker can be detected in the four candle power lamps and would be objectionable in most places. The lamps are very satisfactory in the way we have used them, that is for decorative lighting.

We are also using, with very good success, this 25-cycle current to operate a moving picture machine arc light, although the flicker is much more noticeable in the arc light than it is in the incandescent lamps.

BAD FEED WATER.

BY E. L. WHITE, Handley, Tex.

The Power Station of the Northern Texas Traction Company continues to send out the "juice," notwithstanding the trouble which is occasioned by bad feed water. The question of feed water has been a serious one for some time. With the beginning of 1907, it was thought that the water question was solved, owing to the bringing in of an artesian well giving a four inch flow. This water, when turned into the boilers, steamed beautifully, and it was thought that "priming" was a thing of the past, but after a

while the water began to fail, necessitating using air to lift it, and shortly after there was no natural flow from the well, all the water being forced out by air. This well was drilled to a depth of about thirteen hundred feet.

Finally the water in this well became so bad that it was impossible to use it, and a chemical analysis showed quite a lot of carbonate of soda. It was then decided to try and repair the well, and water from the artificial lake was turned into the boiler. Upon investigation it was found that the well had filled up to a depth of three hundred feet or more, probably caused by caving in of the sides of the well. This caving of loose dirt, together with the agitation of the water by the air, probably brought up solids in suspension which aggravated the trouble of priming of the boilers. The water of the lake is a mixture of water caught from rains and artesian water condensed from the boilers, the condenser discharging directly into the lake. This water behaves very badly in the boilers, priming being a daily and frequently hourly occurrence.

Despite this trouble, there has been no serious interruption to the service, the voltage at the station being reasonably constant, except when the exciter engines get water. When this happens, the voltage drops very materially, as, in some instances, exciter engines will almost stop. Handicapped in this manner, we frequently pull through peaks amounting to from 2500 to 2800 kw., and even higher, the indicator of our 4000 ampere recording ammeter sometimes going over completely off the chart. This with a rating of 1800 kw. capacity.

On July 4, the output for the day was 35,000 kwh. Despite the unusual load, the station went through without mishap, except the heating of two step-up transformers. Heating was caused by heavy load.

News from the Stone & Webster Engineering Corporation

GENERAL NOTES.

In September, 1906, the Stone & Webster Engineering Corporation, foreseeing considerable rises in the price of copper, began to place future delivery orders, anticipating the requirements of the companies managed by Stone & Webster as far as they were able to judge them.

During the gradual rise in price of copper since September, 1906, future delivery orders have been placed for 1,950,000 lbs. resulting in a net saving to the companies of 26,675.

- F. W. Lund, who until recently was employed by the Fosburg Construction Company, general contractors, left Boston August 5, for Dallas, where he will act as Chief Accountant under Mr. Goodenough.
- R. M. Henderson, constructing engineer, who recently left the employ of Arnold & Company, contractors of Chicago, to associate himself with the Construction Department, is busily occupied in following up the construction work at Pawtucket, R. I., and Lowell, Mass.
- K. A. Andren will sever his connection with the Corporation September 1st to accept a position as general sales agent of machinery and rolling stock, with Thomas F. Carey, 70 State St., Boston, Mass.
- Mr. J. F. Vaughan, of the Engineering Department, returned August 1 from a trip to Key West and Pensacola.
- R. G. Hall, formerly Accountant at Dallas, is now connected with the Accounting Department at Boston.

- E. H. Sennott, who was previously employed as Accountant at Columbus, Ga., is now employed in a similar position in the Engineering Corporation's office at Lowell, Mass.
- F. J. Donovan, who was formerly Assistant Treasurer of the Pensacola Electric Company, has been transferred to the Boston office, where he is assistant to Mr. G. C. England.

BELLINGHAM. WASH.

We were somewhat concerned a few weeks ago to hear that Mr. S. L. Shuffleton had had a serious accident and was in the hospital with a chance of losing a leg. The following reassuring letter was received from him, however, under date of July 23, 1907.

"I regret to inform you that I had the misfortune to break my left leg by becoming entangled in the crank of a gasolene engine last Sunday; surgeons tell me that I will probably be in the hospital for a month or six weeks. Unless instructed to the contrary by you, I will, however, continue to purchase rights of way for the Interurban. I can direct this work from the hospital nearly as well as from the office, and I can also continue the engineering work by the same means."

It seems that Mr. Shuffleton is a hard man to put out of business.

KEY WEST, FLORIDA.

We have not been able to close up our organization at Key West, August 1, 1907, as we had hoped, owing to some unforeseen difficulties in the overhead reconstruction and to the fact that several of our line crew have been down with fever. It is confidently expected, however, that our work will be closed out by the middle of August.

JACKSONVILLE, FLORIDA.

Quick-sand has seriously interfered with the excavation for the new stack foundation. It was found necessary to take down part of the boiler room wall and temporarily support one of the present batteries of boilers. The excavation for the stack foundation has now been completed, and pile driving was begun August 1, 1907.

SEATTLE, WASH.

Mr. G. O. Muhlfield, Construction Manager, has been in Seattle during July and has thoroughly gone over the various

pieces of work which have been in Mr. Whitson's charge for the past year.

TERRE HAUTE, IND.

The work on the Paris extension is progressing favorably in spite of a very rainy summer, and it is expected that this line will be ready for operation by September 15, 1907.

(L. E. Eustis.)

News From The Companies

PLYMOUTH, MASS.

This attractive old town has increased yearly in popularity as a summer resort, and the summer of 1907 is no exception to this rule. All the cottages and hotels are full and an air of gayety pervades the place. The Pilgrim Hotel is enjoying its banner season; golf and motoring seem to be the chief amusements. On a pleasant Sunday, the stable yard might pass for an outdoor automobile show, so many cars are parked there.

Mayflower Grove is receiving its share of Plymouth's patronage and is doing much the biggest business in its history. Theatre receipts are running well ahead of the best previous season and all other amusements are making new records.

The problem of properly advertising park attractions in a section without a local daily newspaper is a difficult one, and an outline of the methods in use on one small road may be of interest.

On Tuesday of each week the agent supplying the theatrical attractions sends the bill for the coming week's show. Advertisements are then written up for the weekly newspapers, covering the show and any special attractions such as fireworks, balloon ascension, etc., occurring the next week. Reading notices covering all matters of interest in connection with the Park are also prepared for these papers. The cost of this advertising is small, as the space is taken by contract for the season.

The theatrical agent also supplies 100 one sheets for the show. Half of these are turned over to the local bill poster and are put on his boards at a cost of 4 cents each. Twenty-five of them are placed upon bill-boards owned by the railway company and placed in advantageous locations along the line. The remaining twenty-five are used in store windows, the window space being paid for by free transportation.

The company also gets out a number of dasher signs, 18x24, some of which are pasted on the usual dasher boards and carried on the cars, and others are placed in store windows. The latter locations are paid for by free transportation. Separate dasher signs are printed for each attraction, namely, one for the theatre, one for Sunday concerts, one for fireworks, etc., and the subject matter is limited to seven lines, making the sign easily legible on a moving car.

The work of placing this advertising in windows is done by the theatre ticket seller. This man also publishes a 4-page paper weekly, two pages being devoted to news concerning the Park and to advertising coming attractions, and two pages being filled with commercial advertising. Each issue is 10,000, of which 5,000 are placed in the company's cars, and 5,000 distributed from house to house in the various towns along the road. The commercial advertising yields nearly 100 per cent. profit over cost of printing, and this goes to the publisher, who assumes all financial responsibility and also gives the two pages for the use of the railway company free of charge. This little paper is an excellent means of advertising attractions and reaching the public. The supply in the cars is renewed nightly, and at the end of the week there are seldom more than a couple of hundred of the papers left in the That the papers are a good advertising medium is proved by the fact that there are always several business houses waiting to secure space in the paper.

The object aimed at is to make it practically impossible for people not to know of the existence of the Park and of the attractions offered from week to week. The best advertising of all, however, is the theatre patron who has been pleased with the performance he has seen.

BROCKTON, MASS.

Brockton is now enjoying one of its old-time building booms. Contracts have been awarded for a new store and office building three stories high, to be built of brick and steel with concrete floors and roof, and to cost \$107,000. The three story building known as the Gardner Block is to be raised three stories, making it the first six story building in the city. The new four story brick building for the L. Richmond Company is in the course of construction, in addition to twenty or more three-flat tenement houses, two eight flat and one twelve flat apartment houses.

Work has been started on the Edison Company's new substation, the stock building, meter and arc lamp buildings having been razed to make room for this addition. It has been decided to make the substation building two stories in height, which will provide for an arc lamp room, meter room, linemen's room, stock room and draughting room on the second floor.

An order introduced in the City Council by the local laborers' union, calling for a Saturday afternoon holiday with a full week's pay for city laborers, created quite a little interest in labor circles, and caused a great deal of talk when it was passed by the upper board, where the Democrats and Socialists hold the balance of power, but on its reaching the lower board, where the Republicans are in the majority, the order was killed by a large vote.

With the building of our new station in East Bridgewater, the transmission lines across country to Stoughton and East Bridgewater, our new substation and underground work in Brockton, these are certainly busy days.

FORT WORTH, TEXAS.

The new pavilion and summer theatre at Lake Erie on our Interurban, which replaced the one destroyed by fire in May, was opened on June 25, and we expect this to give us additional travel on the Interurban between Fort Worth and Handley, for the rest of the season.

July 12 was quite an event in Texas, as on that date, which was ninety days after the adjournment of the legislature, several new laws went into effect. The principal laws affecting street railway properties are the tax on three-quarters of one per cent. on the gross earnings, the Anti-Pass law limiting the issuance of free passes to employees, dependent members of their families and a few other exceptions, and the separation of the white and colored races by means of signs placed in the cars.

On June 1, Mr. A. W. Q. Birtwell became assistant treasurer of the Northern Texas Traction Company, succeeding Mr. E. C. Reichardt. Mr. Birtwell was, prior to that time, assistant treasurer of the Houston Electric Company.

We have adopted solid rolled steel wheels on our Interurban cars, and the results, so far, have been very satisfactory. The first car equipped with these wheels has made 32,500 miles, and the wheels show apparently no cutting of the flanges. The only

wear developed so far, is that on the back of the flange caused by grooved rails. We have made some tests with brake shoes on these wheels, and have obtained 10,000 miles with reinforced steel shoes, against 3500 miles with cast shoes. The cost of the reinforced steel shoes is 2.1 cents per pound, while the cost of the cast shoe is 13-4c. per pound.

The 400 kw. rotary for the Portable Sub-station has been put in place, and transformers for the same are now in transit.

The double tracking of the river bottoms near Dallas on the Interurban, which work is being done by the Stone & Webster Engineering Corporation, will probably be finished some time this fall.

(G. H. Clifford.)

HOUGHTON COUNTY, MICH.

The official opening of Electric Park for the season was held on July 7, when some fifteen hundred people were in attendance to enjoy the concert given by the famous Calumet & Hecla Band, and to inspect the new pavilion, which was opened to the public for the first time.

The new building, which is much larger than the old one destroyed by fire last season, is a wooden structure, the dimensions of which are 172 by 72 feet. Wide verandas extend along two sides, which, with the balconies and dormer windows above and the rustic method of construction, give the pavilion an attractive and rural appearance.

The dance hall has a spacious hard wood floor, which is 68 by 50 feet. The hall is very neatly decorated with flags and bunting and electric lights. At the north end of the hall is a stage, flanked by ample dressing rooms. At the south end is a model restaurant, where light refreshments may be obtained.

The park itself is in a pretty grove of maples midway between Houghton and Calumet, on the main line of the street railway. In the evenings the park has a most festive appearance, due to strings of incandescent lamps suspended from the trees. Numerous swings and "see-saws" add to the pleasures of the place, while at one side of the park is an excellent baseball diamond.

Free dances are given at the park on three evenings during the week, and on Sunday afternoons the Calumet & Hecla Band renders one of its excellent concerts. On other days the park may be engaged for private dances or picnics. Already several private parties have been given and many more have been booked for the remainder of the season.

It is the policy of the company to maintain a model resort in every way, especially one which will appeal to the ladies and children. No intoxicating liquors are allowed on the grounds, and the best of order always prevails. The growing popularity of the park is attested by the increasing attendance each week.

The season being so short in the Copper Country, a great outlay on a pleasure resort would hardly be practicable; yet it is the intention of the company to add attractions from time to time, so that eventually Electric Park may even rival the Great White City.

Mr. Frank O. Mayotte, Claim Agent of the street railway company, is manager of the park, and much credit is due him and his corps of assistants for maintaining the resort at a point of maximum attractiveness.

The work preparatory to laying the new granitoid paving at the west end of Quincy street, in Hancock, is well under way, nearly the whole of the 1650 feet of street to be paved having been brought to sub-grade. The street railway has already begun to lay its new 7-inch girder rail, and the iron trolley poles have been erected on the south side of the street. On the north side of the street the Electric Light Company is putting up 35 ft. iron poles, which will be occupied by the circuits of both companies.

A rather peculiar condition exists in the operating of the railway, inasmuch as the city compelled the company to remove its track entirely from the section to be paved. This necessitates the transferring of passengers and express in Hancock, which has caused considerable derangement in the schedule of the road. There are three cars marooned on the two and one-half miles of track on the Houghton end of the paving work. As these cars are unable to get to the car barn, a pit has been made at the East Houghton terminus for making necessary repairs and for keeping cars at their usual high point of operating efficiency. This is done by raising the rails on a trestle some four feet above the ground.

Can any of our sister companies beat this? On the morning of July 1st there was quite a flurry of snow in Calumet. While there was no feeling that it might be necessary to get the snow ploughs into service, it was nevertheless a rather remarkable sight for a place no nearer the North Pole than we are.

The 250 kw. railway generator recently installed at the Lake

Linden plant is in operation, and the service is much improved thereby, especially on the Lake Linden Division of the road.

An application for a franchise for a gas company has recently been made to the village council of Lake Linden. As this is the fourth application which has been received in the past three years with no gas company yet forthcoming, the situation is not considered serious.

The new power circuit to the Atlantic Mine has been completed and will be placed in operation as soon as the mining company has installed its motors. Fifty horse-power in two-phase motors are being put into the machine shops and surface pump house at the mine location. The lighting service at the mine and at the village of South Range will also be on these new circuits.

The telephone exchange has been installed in the Houghton office, and is most satisfactorily filling a long felt want.

Mr. P. A. Staples, Massachusetts Institute of Technology '06, has recently arrived from the Boston office and has joined the force of the Electric Light Company. Mr. Staples is a graduate civil engineer, and has had considerable experience on the United States geodetic survey in the Philippines and other parts of the Far East. He was also employed by J. G. White & Co. before coming with Stone & Webster.

The water meters for measuring the feed water of the Houghton station of the Electric Company are being calibrated and adjusted at the hydraulic laboratory of the Michigan College of Mines at Houghton.

In one of the showers recently the down pour was so incessant and heavy that one of the streets on the side hill in Hancock had a great part of its bed washed down on to the railway track on Front street. It required the force of a team of horses with a scraper and a gang of men for nearly half an hour to get the track clear again for operation.

The gas service in Houghton was rudely interrupted for several hours some few days ago by the United States recruiting ship "Wolverine" anchoring in the lake on the gas main between Hancock and Houghton.

The construction work at the Houghton station of the Electric Light Company is progressing with marked rapidity. The foundation for the new 1000 kw. turbine and auxiliaries is being laid, and the work of building the high tension transformer and switch room will soon be commenced. Erecting Engineer Ralph, of the

Stone & Webster Engineering Corporation, is in charge of the work.

Through the courtesy of the General Electric Company, the Contract Department of the Electric Light Company will have the service of a woman demonstrator, beginning July 29 for a period of ten days. She will be in Houghton and Red Jacket for the purpose of showing to the general public that cooking by electricity is convenient and practicable, and not a luxury or experiment. We look for good results from her demonstrations.

We note in one of the county papers that the Calumet & Hecla Mining Co. has paid out \$4,000,000 in dividends this year, which is equivalent to 160 per cent. on its capital of \$2,500,000. The total amount paid in dividends since 1871 by the Calumet & Hecla is over \$100,000,000. Many of the other mines have returned many times their share capitalization since their incorporation, such as the Quincy, the Tamarack, the Wolverine and the Osceola Consolidated.

The growing scarcity of labor in the Copper Country is becoming quite evident from the fact that contractors are having difficulty in obtaining sufficient labor even at high wages.

After several months of agitation on the question of municipal ownership, the city of Hancock has finally granted the Electric Light Company a five-year contract for lighting the city streets and public buildings.

An ordinance has been passed by the Hancock Council requiring all poles and overhead wires to be removed from that section of Quincy stret which is now being paved, and that all wires shall be placed under ground by August 1, 1907.

JACKSONVILLE, FLORIDA.

Jacksonville is located on the St. Johns river, in Duval county, Florida. The city is seventeen miles from the Atlantic ocean, has an area of seven and one-half square miles and is fourteen feet above sea level. It has seven miles of water front with a depth sufficient to accommodate ocean steamers. It is the metropolis of Florida and the gateway to Florida and the West Indies. It is the logical distributing point for a radius containing two millions of people. It is within thirty minutes' ride of one of the finest ocean beaches in America.

In 1890 the population of Jacksonville was 17,000; in 1900 it had reached 28,000, and at the close of 1906 it had passed the

50,000 mark, making an increase of over 85 per cent. To this there should be added 16,000 suburbanites and 43,000 winter tourists.

The following table of clearing house receipts for the past eight years will show more conclusively than anything else the steady and unfaltering growth of the city.

Year	Amount
1899	\$12,642,953
1900	12,733,048
1901	16,757,772
1902	18,927,504
1903	26,112,716
1904	43,265,462
1905	60,000,000
1906	72,018,826

The improvements in process of construction in the city at this time will cost, when completed, over \$12,000,000.

After looking over all of the conditions existing in Jacksonville at this time and at the brilliant outlook for the city's future, it can be truthfully stated that there is more striking evidence of general prosperity than at any time since the city's birth.

The scar, three quarters of a mile wide by two and one half miles long, made by the great fire of May 3, 1901, through the very heart of the city, has been entirely removed, and in place of the old buildings burned, modern fireproof structures have been erected. Jacksonville stands before the world today a stately municipality, crowned with well earned prestige as a city of thrift, enterprise, energy and progress.

Conscious of her many natural advantages, pulsating with pluck and vitality, her people imbued with confidence in the destined greatness of their city and acting in concert in all matters of civic concern, Jacksonville gives promise of becoming before long the greatest and most important city on the South Atlantic seaboard; a city that must be visited before its many advantages can be realized.

In order to keep up with the marvelous growth of the city, the Jacksonville Electric Company applied to the City Council for a new franchise, whereby it could extend its lines and greatly improve its system. This franchise was passed by the City Council on January 15, 1907, but the city charter requires all public franchises to be submitted to a vote of the people. This was done on the 16th of April, and the franchise was ratified by a very flattering majority of over eight to one.

The construction work on the extensions is progressing very rapidly. The beautiful parkway and avenue of palms on Main street has been widened to make room for the double tracks. And although there was a great deal of adverse criticism when the widening of the parkway was first discussed, every one agrees now that the street will be even more beautiful than before.

Nine of the fourteen new double truck cars built by the John Stephenson Company have arrived and are in operation. The remaining five have been delayed in transit, at Norfolk, Va., but are again moving, and it is hoped that they will arrive in a few days.

The cars placed in service are on our Riverside & Main Street line, and the patrons of this line, as well as all Jacksonville, are very much pleased with their appearance. A word concerning the main features of these cars may be of interest. They are straightsided double truck closed cars with open platforms, having entrances at each side, monitor roofs and clam shell hoods over platforms. Side windows are arranged for two sashes; upper section lifts, and the lower section can be lowered and concealed by a hinged cover. The cars have a seating capacity for forty-four persons; sixteen "walkover" cross seats and four stationary longitudinal seats, two at each end, suitable for three passengers per seat; two wide, sliding doors at each end of car, provided with drop sashes. The platforms are equipped with "Wood" type gates The ceiling is bird's eye maple put on longitudion each side. nally. No veneering of any kind is used in these cars. The inside finish is natural cherry. Twenty 16 c. p. lamps provide ample light for the interior. The headlights are 32 c. p. set in Neal reflectors, these lights being in multiple series with the signal and sign lights. In addition to the incandescent headlights the cars are provided with Crouse-Hinds Imperial arc headlights, type D.

Besides the hand brakes, the cars are equipped with General Electric Straight Air Brake-Schedule S. M. I.

The trucks are Brill 27 G. E. 1 and Standard Motor Company's 0-50.

The cars are provided with two Grasberger drop trolleys. The electrical equipment consists of 4 G. E.-54 motors, 25 horse

power each and K 28 B controllers. The general dimensions are as follows:

Length of body
Length over platform42 ft. 4 in.
Length of buffers44 ft.
Length of platform 6 ft.
Width over side sills, including sheathing 8 ft. 6 in.
Width over all 8 ft. 8 in.
Width inside 7 ft. 8 in.
Height of lower step from roadbed 15 in.
Height from rail to trolley board
Width of aisle24 ft.

MINNEAPOLIS, MINN.

That Minneapolis recognizes the value of getting together within the organization and of effective team work in the company's relations with the public, is shown by the double system employed to secure these results.

Six months ago The Minneapolis General Electric Company started the plan of having a meeting of the heads of departments twice a week in the Manager's office. These meetings are held in the early forenoon and are attended by the Manager, Superintendent, Contract Agent, Assistant Treasurer, Purchasing Agent and Engineer. Questions affecting the organization are discussed and stenographic notes taken by the Manager's secretary.

About the same time the Contract Department began to meet one evening of each week for a couple of hours. These meetings are informal, and as far as possible all differences of position and experience are forgotten.

The men with the company having special training are called upon for talks along that line. The head of the meter department has given some talks on meters and how to read them. Special lamps and all the different things coming up in the work of the solicitors have also been discussed. A question box is kept on a convenient desk, and the men drop therein the questions that have come up during their work and about which they were in doubt. These questions are carefully answered by either the Contract Agent or the Engineers at the meetings.

Some time ago nearly every man in the Contract Department began a course in salesmanship, and an hour of each meeting is usually given to the discussion of the points in the course.

As part of this work, and to secure a little variety in the program, a debate is occasionally held on some subject related to the business. These have created considerable interest and have received careful preparation.

New life has just been given to the meetings of this department by the coming of Mr. Gille as Contract Agent. Having been in charge of the commercial department of the St. Paul Gas Light Company for the past nine years, he brings a valuable experience along the line of both gas and electricity. Mr. Gille is a firm believer in the weekly meetings and will continue the work on the same general plans. He holds that the meetings should begin and end on time, and above all that there be something definite for the men to come for, so that they will not feel they are wasting time. As a matter of fact, instead of regarding the meetings as a bore and a deprivation of social privileges, they take pride in them and in taking part, and men from the other departments are asking permission to attend.

The work for the coming year, as outlined, includes the completion of the work on salesmanship, a systematic course in electricity under the direction of one of the engineers, debates and literary training, discussion of questions and policies affecting the company and the general public, special lectures, and also the fitting up of a reading room for the magazines and reference books as an aid in the general plan.

(W. A. Williams.)

An interesting feature in connection with the introduction of Taylor's Falls Power in Minneapolis is the use of a 1000 Kw. machine in the Main Street Station as both motor and generator. This machine normally operates as a 60 cycle 13,200 volt 3 phase generator and is installed directly in the line shafting driven by water wheels and belted steam units. When the load is light on the shafting this machine runs as a generator and is phased in with Taylor's Falls.

Should the load increase on the shafting and hence the speed begin to decrease, this machine immediately becomes a synchronous motor driven by Taylor's Falls. When the load on the shafting drops off again and the speed tends to increase, the machine changes back again to a generator. Thus it floats between the two systems, generating at one period and motoring at another.

The only attention required of the operator as the machine changes from generator to motor is to change the connections of the potential transformers for the switchboard instruments and adjust the excitation of the field for proper voltage or power factor. Operating in this manner it has improved the regulation as well as given increased capacity when Taylor's Falls power has been interrupted.

The plans for remodeling this station contemplate the installation of two more of these units, which will greatly strengthen and simplify the system.

(F. N. Simpson.)

Plans are now under way to transfer the demonstration room from the small store where it has been for the past year and a half to the main floor of the company's own building. This will save the rent, amounting to \$75 per month, as well as provide one of the most attractive places of the kind in this part of the country.

The main floor is at present occupied by the solicitors only a small part of the day. It was decided that this space was too valuable to be used so little, and the second floor, at present used as a stock room, will be remodeled for the solicitors' desks and club room. The stock room is to be transferred to the new store building across the river near the main station.

Asst. Treasurer H. B. Sewall is spending his vacation at Annandale, which is one of the many noted lake resorts of Minnesota.

Purchasing Agent John J. Miley starts on a vacation trip to Boston July 24.

W. H. McGrath, Manager of the Houghton County Companies, stopped over here a day recently on his way home from Omaha.

OAK CLIFF, TEXAS

We have a good barn adequate for our needs, having had an addition of one hundred feet put on lately, extension of pits, new yards and loop. Also have machine shop well fitted up with good tools, namely:

One five horse motor, General Electric make.

One Blount tool grinder.

One twenty inch Sibley & Ware drill.

One twenty-two inch American Tool Company lathe.

One power blower for forges.

With this complement of tools, we are enabled to handle any work that we may be called upon to do.

Our barn is well lighted both day and night, having ample skylights and incandescent circuits throughout, thus making it convenient to work at any time.

(J. B. Gallagher.)

Oak Cliff, a suburb of Dallas, is situated about four miles southwest of Dallas on the highest point in Dallas County, overlooking some of the finest farming country in the Lone Star State.

Oak Cliff was founded by T. L. Marseilles in the year 1888. It is noted for its healthy climate and pure water, having a city supply of artesian. It has a population of 9000, three public schools (the fourth one will be completed in a few months), and three colleges where several hundred pupils are enrolled every year. One of the best features of Oak Cliff is that it is prohibition. We can boast of one of the prettiest parks in the South, Lake Cliff, situated on the banks of Lake Llewlyn, a natural lake of fresh water. You can find amusements there for old and young, one and all, boating, baseball, skating, shoot-the-chutes, and other things too numerous to mention. About 5000 of the population visit this park each Sunday.

In 1888 T. L. Marseilles built a steam road connecting the two towns. In 1894 the road was electrified. In 1902, the Northern Texas Traction Company bought the electric line in Oak Cliff. Since that time, they have built four miles of new line, three miles of double track, and at the present time they are building a mile of double track through the Trinity river bottoms, which will add greatly to the street car service. Since the Northern Texas Traction Company took charge of the lines, the town has grown about one-half of its present population.

(J. P. Morton.)

PENSACOLA, FLA.

In last month's issue we gave the readers a general outline of the advance that had been made in the Railway Department, and it is our purpose this month to give a more detailed account of the work.

At the present time fifteen cars are operated daily over twenty and one-tenth miles of track, classified as City, and Suburban. The City cars operate on an eight and ten minute headway, while those on the Suburban are run at hourly intervals with a summer schedule of thirty minutes.

The City cars carry a double motor equipment, consisting of Westinghouse No. 12-A, 25 horse power motors, and the Suburbans have four motor equipment, G. E. No. 80, forty horse power each: these latter cars have air brakes and arc headlights. The air brake equipment is that furnished by the National Brake & Electric Company. These cars also draw two to four trailers, and these have air brakes with emergency safety device by which the brakes may be applied from any trailer, as well as from the motor car. This is the first time, we think, that a device of this kind has been used by a Stone & Webster property, and perhaps it would be well to state that it has given good satisfaction.

The rules of the company require the motormen and conductors to purchase uniforms twice a year, and these are made to conform to a standard adopted by the company. The summer and winter uniforms are alike, except in the weight of the goods, while a straw cap for summer replaces the cloth cap used in winter. The silver buttons on the conductors' uniforms, as well as the gilt on the motormen's, bear the full name of the company in raised letters.

The company operates no parks, and the patronage comes from two sources, namely, those riding to and from business, and those riding for pleasure; so that the following figures will be surprising as well as interesting:

In January, 1907, the gross earnings showed an increase of 28 per cent. over the corresponding month of 1906; February showed 26 per cent.; March, 35 per cent.; April, 32 per cent.; May, 40 per cent., and June, 36 per cent.; an average of 33 per cent. for six months.

To keep pace with the increase of patronage, it has been found necessary to order from the American Car Company six new cars, four of which are ten bench open cars, and two, twenty foot closed cars, all with double motor equipment, consisting of G. E. 81, thirty horse power motors.

The fare on the Suburban line has been reduced about 25 per cent., yet the increase in traffic has more than made up in gross earnings for the reduction in fare. This, no doubt, is largely due to the better service which the company is giving on this line. The Suburban line reaches to the United States Navy Yard and Forts Barrancas, Pickens and McRae.

While the growth of the Railway Department has been remarkable in the past, all indications point to even greater increase in the future.

(E. S. Roberts.)

PONCE, PORTO RICO

Business in general is a little dull in Ponce this month of July. But little building is being done and, partly due to the recent strike in New York, but little freight is being landed in La Playa; consequently the freight business of this company is very small.

Rain is plentiful now and good crops are predicted for next year. Work on the new hospital "San Lucas," situated on a hill north of the city, is rapidly nearing completion, and by the first of August the installation, of about fifty sixteens, and numerous electrical apparatus should be cut in. The inside wiring of this hospital was done by the jobbing department of this company. They will also have a one horse power, motor driven, pump for their water supply, as the hospital is almost at the same level as the reservoir.

Many of the more wealthy residents are moving to the country and closing their houses, so that we are cutting out a good many equivalents, but should get them all again in the fall.

TAMPA, FLORIDA.

During the past month Tampa has extended the city limits by taking in territory on the north and east, which is thickly settled. The territory annexed was brought in under an agreement that it would not be taxed for past debts of the City of Tampa, and only held liable to taxation for future improvements and expenditures. The annexationists carried the election by a vote of five to one. It is now proposed to call another special election some time during September next to annex territory on the west of the city, but not to include West Tampa. This gives Tampa several new wards and increases the population of the city proper by several thousand people, making it take rank among the leading cities of the state.

West Tampa is building several new cigar factories, which will be occupied within the next few months by firms employing from 500 to 700 cigarmakers. They have succeeded in getting one of the largest factories of Havana to remove to that locality on account of the labor situation in Havana.

Since January 1, 1907, the sum of \$652,000 has been spent in the territory immediately west of Tampa and in West Tampa, in new factories, street paving, improvements in new subdivisions, etc.

The cigar factories all over the city are putting back the men laid off temporarily on account of the scarcity of the tobacco crop in Cuba, and prospects are very bright for a wonderful increase in business between now and the holidays. Conditions among the cigarmakers themselves have also improved since the termination of the strike in Havana. The ending of this strike was the cause of great joy here, three days being given over to speechmaking, parades, etc., by the men in the various factories. Several hundred cigarmakers, who came from Havana to Tampa during the strike, have returned home, and the levy of a tax each week on every man working in Tampa to be used to aid the men out on strike in Havana has been stopped, thus putting into local circulation a greater amount of the wages received in the Tampa factories

Post office receipts for the month of July show a decided increase over 1906, the figures being as follows:

July,	1907	 \$9,824.90
July,	1906	 7,916.50

The Tampa Electric Company purchased the municipal lighting plant of West Tampa during the month of July. The proceeds of this sale will be used by West Tampa in extending the brick pavement on the main streets of the town.

Mr. R. G. Carroll, chief clerk of the Tampa office, was transferred to become assistant treasurer at Pensacola.

SAVANNAH, GA.

A number of changes of moment in connection with the local organization have been worked out since the last issue of the Journal. The Contract Department, which was re-organized late in the spring under the management of W. R. Sweany, formerly contract agent of The Minneapolis General Electric Company, has been increased by the addition of two men, one local, the other a special power solicitor, E. G. Howard, formerly connected with the General Electric Company's Boston office. The working force now consists of six solicitors, including Mr. Moore, who remains as Mr. Sweany's assistant. This organization is doing very effective business in the face of competition, and is breaking all records in new business getting. The outlook for power business is particularly promising, and already our station loads are almost as heavy

at the year's lightest period as they have heretofore been for an average winter's peak. If the present rate of increase continues, additional generating capacity will soon be necessary.

Our line department, which has been in an unsettled condition since the first of the year, has recently been placed under the charge of J. F. Wilson, who was formerly associated in Little Rock, Ark., with Mr. Trawick, who has just taken charge in Tampa.

The most important change in the organization, which becomes effective August 1, is the appointment of M. L. Sperry as Manager of the company in place of L. R. Nash, who will return to the Boston office. Mr. Sperry comes from Minneapolis where he held the position of General Superintendent. Mr. G. W. Rounds will be associated with Mr. Sperry. He will have charge of the railway department, to which he brings a wide experience from the Stone & Webster companies at Terre Haute, Ind., and Hancock, Mich., as well as from other similar connections.

The company's five year contract for city lighting expires at the end of this year, and the competing company is to be reckoned with in connection with the new contract, which the city officials have already begun to consider. A consulting engineer has been retained by the city to advise them regarding the technical details of the new contract. It will be necessary for this company to consider an entirely new equipment, the present system of old open arcs having been a bone of contention for some time under the present contract.

One of the features of the advertising campaign which the company is conducting with the assistance of Mr. Converse D. Marsh, is a plan for general advertising of the city of Savannah. The trade bodies, as well as the city officials, have entered into this campaign enthusiastically, but the movement has recently received a serious set-back through the action of a new state legislature. Among the first bills to be introduced in the session was one to make Georgia a prohibition state. This bill has had the active support of a large majority of the legislators, and there is little doubt of its passage within a few days, to become effective on January 1, of next year. The trade bodies of Savannah, as well as other large cities of the state, have protested against the injury to the business interests of their cities from such a measure, and this will apply particularly to Savannah, the leading seaport city. The result will be a large loss of revenue to both state and cities and

a material loss of business, both directly and indirectly, to this company. It is doubtful whether under the circumstances the city will feel able to contribute toward the advertising campaign, although such a move would seem doubly necessary if continued development of the city is desired.

SEATTLE, WASH.

The weather for the month of July, in the Puget Sound country, has been as near perfect as weather could be, in that every day but one has been sunshiny, with comfortable temperature; and this perfect weather condition, coupled with the Convention of the Christian Endeavor Society, held in Seattle from the tenth to the fourteenth of July, has had its effect on the gross business done by the street car lines. The Christian Endeavor Convention was very successful, in that it is estimated that it brought to Seattle, on account of the low rates granted by the railroads, some ten or twelve thousand persons. The meetings were held in large tents, pitched in a convenient central location, served by several street railway lines, and the additional business because of the location was handled very comfortably. Seattle is destined to become a considerable convention city, because of its delightful surroundings and comfortable summer temperature.

The annexation of several suburbs, including West Seattle, Alki, and Spring Hill, and considerable county territory, to the City of Seattle, has been consummated during the month. The area of Greater Seattle is now practically doubled, only one considerable suburb now remaining to come in, namely, Georgetown, with about five thousand people. The population of the greater city is now thought to be about 240,000.

Construction work on new lines of street railway is steadily progressing, and before the winter comes on at least four new lines will be added to the railway system, which will afford needed accommodation to thousands who have heretofore had to walk considerable distances to existing lines.

At the new Georgetown power station, a second burnout in the armature coils of the 3000 kw. turbine occurred during the month, but has been repaired and the turbine is now nearly ready for test. The 8000 kw. turbine ordered for this plant, it is expected, will be shipped from Schenectady in August.

Construction work on the grounds for the Alaska-Yukon-Pacific Exposition in 1909 is progressing rapidly. The contract

for the Administration Building has been let, and the work of construction is now going on. Grading contracts have also been awarded, and under the able direction of the chairman of the Buildings and Grounds Committee, Mr. C. J. Smith (who is also a trustee of The Seattle Electric Company), and the Director of Works, Mr. Frank Allen, there seems to be no question but that the fair buildings and grounds will be in complete condition, ready for the opening date.

Mr. Ogden Adams, of Boston, who came to this company over a year ago from the Boston office, as a student in the mechanical department, has concluded to sever his connection with the Stone & Webster organization, on August 1, having had the opportunity to enter the automobile business in a partnership which promises good returns. We are sorry to lose the services of Mr. Adams, but hope that he will be successful in the new field which he is to take up, in which he had had considerable experience in the East.

Mr. R. C. Barton, Cornell, '06, is with us as a student, from the Boston office, and is busily engaged in the electrical and mechanical engineering department. As his parents live in Seattle, he is much pleased to be assigned to this company for work, and is making good progress.

Messrs. J. B. Lukes, General Superintendent, and Frank Dabney, Assistant Treasurer, will attend the annual convention of the American Street & Interurban Railway Association at Atlantic City in October, representing this company. After the convention they will visit Boston and renew their acquaintance in the Boston office.

TAUNTON, MASS.

The plant of the Cell Drier Machine Company at Taunton, Mass., is nearing completion and will be occupied during August. The land of the company (about 10 acres) extends between the line of the N. Y., N. H. & H. R. R. and the Taunton River. Two spur tracks from the railroad extend, the one to the foundry bins at the charging platform level, and the other into the machine shop. The company has, also, tide water facilities for getting in its raw material and for shipping its product. The buildings are of steel, concrete and brick construction, and consist of an iron foundry, large concrete storage bins, a machine shop, a cleaning house and

an office building. The buildings are high studded, and are equipped with traveling cranes and with modern machine tools.

The company has added to its organization during the past few weeks, Mr. Elliott F. Aldrich as salesman, Mr. George W. Lake as machine shop foreman, and Mr. William H. Stafford as foundry foreman.

Miss M. I. Delhommeau, who has been for some time in the stenographic department of Stone & Webster, is to go to Taunton with the company as stenographer.

Mr. Aldrich was married July 1 to Miss Sarah Bickford of Providence.

This is the second marriage which has recently occurred among the office force of the company, as a few months ago Miss Alice Phinney and Mr. F. A. Tarr were married, both having been connected with the company before and after its reorganization.

CHASE-SHAWMUT COMPANY.

All lines of our electrical specialties show steadily increasing sales, except those that enter into Street Railway and Telephone work (Rail Bonds and Cable Hangers). The decrease in these two lines is due, of course, to the small amount of construction work that has been undertaken this spring and summer.

Harry P. Moore, Sales Manager, was married the middle of June.

K. F. Towler has been transferred to the Cell Drier Machine Company as Assistant Treasurer, with headquarters at Taunton, Mass.

Chester M. Bates has left to accept a position with the Warner Cotton Mills of Newburyport, Mass.

FORT HILL CHEMICAL COMPANY.

Material improvements in the office and power house have just been completed.

Assistant Superintendent Hyde has recovered from his recent illness and is again on duty.

EIBEL PROCESS COMPANY.

Alec Mitchell and John Bailey have been dividing their time between Lenox, Mass., and Wanaque, New Jersey, during the installation of the Eibel inventions at the paper mills in those places.

William Eibel, inventor of the Eibel Process, has been appointed manager of the Rhinelander Paper Company, where he has heretofore been superintendent. This company operates the fastest newspaper machines in the world.

QUOTATIONS

ON

SECURITIES OF PUBLIC SERVICE CORPORATIONS

UNDER THE MANAGEMENT OF

STONE & WEBSTER

AUGUST 1, 1907

NOTE:—Quotations are approximate. Unless indicated to the contrary Bonds and Notes are 5 per cent and preferred stocks 6 per cent non-cumulative. Bonds are sold plus accrued interest.

COMPANY	BOND8	PREF.	OOM.
Blue Hill Street Railway Co., The	100	No pref.	• • • •
Brockton & Plymouth St. Ry. Co.	100	No pref.	••••
Cape Breton Electric Co., Ltd.	90	82	20
Columbus Electric Co.	94	• • • •	• • • •
Columbus Power Co., The	96 95	2	16
Dallas Electric Corporation	98	70	25
Edison Elec. Ill. Co. of Brockton	100 100	No pref.	115
El Paso Electric Co.	96	921/2	471/2
Fall River Gas Works Co.	No bonds	No pref.	230
Galveston Electric Co.	98	88	871/2
Galveston-Houston Elec. Co,	••••	88	871/2
Houghton County Elec. Lt. Co.	100	221/2 8	15
Houghton County St. Ry. Co,, The	90	95	25
Houston Electric Co.	98	88	371/2
Jacksonville Electric Co.	100	95	90
Key West Electric Co., The	••••	3	••••

COMPANY	BONDS	PREF.	OOM.
Lowell Elec. Lt. Corporation, The	105	No pref.	195
Minneapolis General Elec. Co., The	104	108	100
Northern Texas Electric Co.	95	801/2 11	381/2
Paducah Traction & Lt. Co.	90	60 6. 6.	18
Pensacola Electric Co.	95	873/2	26
Ponce Electric Co.	100	No pref.	••••
Puget Sound Electric Railway	100 943/4	88	55
Puget Sound Power Co.	102	No pref.	15
Savannah Electric Co.	98	80	121/2
Seattle Electric Co., The Notes	101½ 100	97	85
Tacoma Railway & Power Co.	100	No pref.	
Tampa Electric Co.	No bonds	No pref.	130
Whatcom County Ry. & Lt. Co.	95	88	49

^{1.—}Cumulative. 2.—No dividend yet paid. 3.—Bonds of Northern Texas Traction Co. 4.—5 per cent. 5.—Cumulative after Dec. 1, '07. 6.—1 per cent paid Dec. 1, '0 and June 1, '07. 7.—6 per cent. 8.—Par \$28. 9.—Listed Boston and Louisville. 10.—Listed Boston. 11.—Listed Louisville. 12.—Listed Columbus, Ohio. 13.—Listed Boston, Columbus Ohio, Louisville. 14.—Listed Louisville, Columbus Ohio. '15.—Held by Seattle Electric Co. 16.—Held largely by Columbus Elec. Co. 17.—Held by Puget Sound Elec. Ry. 18.—4% per cent.

STONE & WEBSTER

Securities Department

OFFICES:

Boston - - - 84 State Street Chicago, 604 First National Bank Bldg.

NOTE. — The Securities Department handles securities for those wishing to purchase or sell, keeps accurate quotations, and gives out information about above companies.

Miscellaneous Notes

COUPONS AND DIVIDENDS DUE

	Per	cent
Sept. 2nd, Edison Elec. 111. Co. of Brockton		
Coupon Notes, 5 per cent	1911	2 1-2
Sept. 2nd, Galveston Elec. Co. pfd. stock	6 per cent.	3
Sept. 2nd, Northern Texas Elec. Co pfd stock	6 per cent.	3
Sept. 2nd, Whatcom Co. Ry. & Lt. Co. pfd stock.	6 per cent.	3
Sept. 15th, Galveston-Houston Elec. Co. pfd.	-	
stock	6 per cent.	3

LIBRARY OF STONE & WEBSTER

Current Literature

Selections from the July Magazines and Book Accessions.

Below are given the larger proportion of the most important references for the month of July.* Although in somewhat classified order it must not be understood that the entries are sufficient in number to make this a reliable list of references to all the articles of substantial interest to us in the periodical literature coming to this office. A card index collection of the items is kept in the library, and special lists on given topics can readily be struck off from the thousands of slips thus constantly accumulating.

It is aimed to give a personal service to members of the organization far and near, and it is hoped that their requisitions upon the library for bibliographies or references on particular topics—whether to do with civil, electrical, mechanical, mining or railway engineering, statistics, costs, depreciation or finance in general, municipal ownership, getting new business and the like—can readily be fulfilled.

In the list are given, after Nos. 1, 14, 17, 23 and 70, respectively, general class numbers (in parenthesis), which are of some assistance to the members of the Library Department, but are hardly expected to convey a meaning to others. In explanation it should be said that ED, (r), *, and + are used to indicate editorial, review, illustration, and map, table or diagram, respectively. Thus the first reference is to an article with one or more tables or diagrams, beginning on page 283 and being 51 pages long, in the Journal of the Association of Engineering Societies for June, 1907. The contracted titles of the journals are presumably easy of interpretation. Note that the second entry on the list is a reference to an article that appeared in the American Gas Light Journal and was discussed in a successive issue of the same.

^{*} In the course of a few weeks the references should be ready for January—; June of this year, in printed form, and it is proposed to issue such lists semi-annually, the Public Service Journal issuing selected references each month. The costs of the different periodicals and the address of the publishers will be found in the semi-annual publication.

Concrete

(10) Reinforced concrete bldg constrn dis BSCE 1906. CJHogue, LJJohnson & others. +283-51p-Jrnl Assn Eg Soc-6|07

High pressure gas distbn develpmt in U S; pipe used, capacity, etc. Abs RMSearle, EIGE. +90-5.6p-7|15|07; 134-1.7p-Am Gas Lt Jrnl-7|22 (discussion)

3 Inc gas ltg with special ref to inverted burners. HECopp, IGE. +409-9.7-Ill'g Egr-7|07

Generators, Stations, etc

(20) Storage batteries: operation & control. VKarapetoff. +407-5.5p-El Jrnl-7|07

Tests & operating results on the 5,500 kw turbo-generator of the Interborough Rapid Transit Co. *+413-5p-El Jrnl-7|07

New turbine generating station of the Ill Traction system at Peorla. Boilers, coal handling apparatus, boiler feed, etc. *+86-6.2p-St Ry Jrnl-7|20|07

Pacific Lt & Pr Co's plts & sub-stations: San Bernardino gas & Cl plt; High-Grove Pr house, Riverside pr house, etc. *19-5.5p-Jrnl Elg Pr & Gas-7|13|07

Pr factor, alternating current inductive capacity, chemical, & other tests of rubber covered wires of different mfrs. HWFisher, AIEE. +843-23.5p-Trans Am Inst El Egrs-6|07

Elec Ltg (See also 39)

9 Recent advances in artificial ltg: inc lamps, efficiency of a lt selective radiation, the metallized carbon filament lamp, etc. Ed *97-2.2p; *+92-4.7p-Eng News-7|25|07

The relative efficiency of it sources. EPLewis (from Cal Jour of Tech.). +423-4.5p-IE-7|07

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Depreciation, etc (See also 42)

- (70) Acctg for depreciation as prescribed by the Interstate Commerce Commsn. Abs HJDavies, ASIRAA. 32-0.6p-El Ry Rev-7|13|07
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STONE & WEBSTER PUBLIC SERVICE JOURNAL

OCTOBER, 1907

EDITORIAL COMMENT

Particular attention should be called to the "Extracts from the Autobiography of Andrew D. White" on page 250. A word from Mr. White goes a good deal farther with the average American than a word from most men, and certainly the word in question is a very significant one. The passages which we quote this month deal with a few of his observations in Russia. His standing as a publicist of international repute, and as a diplomat of the first rank, secured for him opportunities for a comparative study of industrial and economic conditions such as are possessed by but few. What makes his remarks of peculiar value is that he was able to get farther behind the scenes than most students of European conditions. He obtained not only what his own eyes showed him, but also the real convictions of those entrusted with the actual oversight of the affairs which he was investigating.

His remarks on Count De Witte's policy of government ownership in Russia are entitled to profound consideration. And off especial interest is the statement made to him by De Witte's predecessor in the finance ministry, Wischniegradsky. The latter confessed that he would favor the building of a railroad by private individuals, even if it cost more than government building. Why? Because that would make rich men, and rich men were

what Russia needed. The event seems to have justified Wischniegradsky rather than De Witte. The railroads have beeen built by the government, and Mr. White's Autobiography shows how hopelessly inefficient they are. We do not have to turn to Mr. White to learn how devoid of capital the Russians are for the devolopment of their industries. Their tremendous industrial advance of recent years has been effected largely by foreign capital.

Russia's magnificent resources have enabled her to draw freely on the Continental money market, but the result is that a very great part of the industry is owned and managed by foreigners. Up to the present time this has been a good thing for the capitalists of the rest of Europe, but it is generally admitted that a situation has been evolved which may some day entail anything but pleasant consequences on the international money market. What Russia most needs, in an economic sense, is a large and increasing body of Russians who are earning wealth from the development of the industries of the empire and are conserving this wealth for future development work. The larger this body of men becomes, and the more they are able to save the wealth which they are helping to create, the more rapid will be the building up of the industrial life of Russia, and the more conservative will the methods become.

* * *

Instead of this we see a huge industrial scheme, built chiefly with foreign money, and managed largely by bureaucrats, who are responsible for none of the financial losses which may occur from bad judgment or other cause, but who are in a position to enrich themselves at the expense of the toiling millions of Russians. All this may be very interesting, but no doubt a good many Americans will exclaim, "Of what practical use is this information to us?" It is right here: in some ways the resemblance between the republic of the United States and the despotism of Russia is exceedingly close. There is no country on earth more profitable for our study in certain particulars. Unquestionably, there is no country where government ownership or control of public service corporations can be so profitably studied. It is to Germany that Americans usually turn for ideas on state control, but we fail to make sufficient allowance for one fact, namely, that the whole civil service of Germany

is impregnated with the spirit of the German scientific militarism. We have nothing of that sort in this country. Nor have they in Russia.

The Russian bureaucracy, in its essential features, is not unlike our own system of political government. There is this difference, of course—the bureaucrat owes his appointment to power to the Czar and the American office-holder to the vote of the people. Yet the salient fact is that the Russian bureaucrat is usually a man of about the same type as the American office-holder. He is generally a self-made man who, by indomitable perseverance, has worked his way up from the people. As a politician, he has no superior anywhere; as a statesman and as an administrator he is, as the event has made so clear, an incapable. He is very apt to forget the people, from whom he sprang, or if he remembers them at all, to regard them merely as the victims of his lust for gain. Hence, he is an interesting object of study to all Americans bent on discovering the real effect of government intervention in the conduct of public service corporations.

Economic Rights and Their Attainment

In one of the Labor Day processions we noticed a banner with the inscription, "We want our rights, and we intend to respect the rights of others." Such a sentiment is commendable to the labor unions. It is, however, a sentiment common to the general run of men in their industrial relations with each other. Neither labor nor capital, neither "the public" nor the corporations, can claim exclusive proprietorship in it.

This is a period of agitation with reference to the aims and methods of industry, and the agitation has given birth to the greatest diversity of opinion. Yet of one thing we are convinced, and that is that the average person, whatever may be the side which he takes in any of present controversies, is governed by a right intent. It is well to bear in mind that intent is a very different thing from either aim or method. Intent is a moral factor, and lies back of both the other factors. Intent may be right and both aim and method wrong. This of course is deplorable; but it is not a condition which necessarily portends permanent harm to the body

economic. But if intent be essentially dishonest, economic chaos is as sure to follow as pestilence follows filth.

Such a state of affairs has never existed in the United States. Errors of judgment have abounded in the conduct of our industry, but for the most part an honest purpose has governed our material affairs. There has never been a period without dishonest political agitators, bent on exciting the base passions of the people; nor has there ever been a period without its avaricious and dishonest leaders of industry. These, however, are the exceptions. The bulk of us are well meaning, intent on getting on our own rights and giving to others their rights. It is well to make this point clear; for it is not perfectly clear in all minds, and for that reason this is a period of bitterness in industrial affairs.

The question today is not one of "intent," but of "rights." The people of the United States, as a whole, are intent on securing their rights in the realm of industry—and nothing but their rights. They want neither less nor more than belongs to them in equity and under economic law. We can therefore dismiss wholly from mind the question of intent, and confine our thought exclusively to the question of rights. That is, we can do so with but one word more, namely, that while it is the easiest thing in the world to discover intent, it is often the hardest thing in the world to elucidate rights.

Certain rights in the world of industrial affairs are purely moral in character, and of course it is not hard to discern such rights. It requires no argument to show that it is a dastardly infringement of rights to take a man's money without his consent, to accept value from him and then refuse to return value to him, to forge his name, to destroy his property wantonly and arbitrarily, and to do a great many other things that could be mentioned. But these are not the kind of rights the present agitation is designed to protect; the common law of the land is amply sufficient for this task. The rights now in dispute are of a type more economic than moral, or at least as much so. Now, economic rights and wrongs are puzzles to the common mortal, and even by highly specialized minds they are not always as clearly discerned as they might be.

This is an important consideration. We must bear in mind that what we call our rights in industry are not always an easy thing to define with anything like scientific precision. If they were, ninety per cent. of our courts could be abolished and ninety per cent. of our lawyers and judges sent into retirement. The courts exist, for the most part, because, with the best and most honest intent in the world, it is exceedingly difficult to discover to whom rights belong as between man and man and man and the community of which he is a part. To accomplish this end, it is necessary to scrutinize, with the utmost particularity, all the facts bearing on the question at issue, and to survey them from many different points of view. And even when all this is done, it is not always easy for the court to reach a decision. This fact has been recognized for hundreds of years; courts of appeal exist for the purpose of safeguarding the citizens of a nation against the fallibility of human judgment in determining rights.

The point to which we are forced is this: the ascertainment of rights in the world of industry is a task calling for all the patience, all the seriousness, all the intelligence—to say nothing of all the honesty-of which the nation, in the person of its eightyfive million souls, is capable. If the work attempted by the courts of law and equity is difficult, that now being attempted by the people of the United States is infinitely more so. It is not hard to find the reason for this. At law, it is necessary for the courts to consider the question of justice only; with expediency they have little to do. In determining economic rights, expediency cannot safely be left out of account. In other words, the courts do not have to look to the remote consequences of their acts. Their maxim is fiat justitia, ruat coelum. But no sensible man, in seeking his rights in the realm of industry, would think of pressing them to the point of making the heavens fall. He might declare, with St. Paul, that "all things are lawful unto me," yet he would be pretty sure to add, "but all things are not expedient." Abstract justice, when acquired at the expense of about all that constitutes the comfort of life, is not a priceless treasure. Justice and expediency are the two factors in determining rights in the world of economic affairs. The one cannot safely be applied without the other.

It seems to many that that is the danger which, more than any other, confronts this nation today. Everyone must await with eagerness the day when exact justice shall be meted out to every man, woman and child constituting the world of economic affairs. But before justice can be meted out, it must be ascertained exactly where justice lies. Every constituent member of the American commonwealth should be secured in every one of his economic

rights, so far as possible; but this implies that his rights shall be definitely ascertained by patient investigation of all the facts bearing upon them. Here we should find a close analogy to the courts of law and equity. But in conveying rights to those to whom they really belong, when once the rights have been ascertained, there is crying need of expediency. Justice is the motive power and expediency is (or should be) the guiding hand in effecting economic rights.

But expediency is where we Americans are apt to be weak. We have lost our old English love of making haste slowly (indeed, the Englishmen of Great Britain now seem to be losing it), and have made considerable headway in acquiring the love of settling great practical questions by deductive logic. Yet it is a mistake to be dogmatic. We must discriminate between rights and between wrongs. A thing may be a right at one time or place and a wrong at another time or place—that is, an economic thing. For example, many of the things connected with public service corporations that are now censured by the public-methods of capitalization, prices paid for use of streets and highways, rate schedules, fafurnished, etc.—were hailed as the right things in the right places when the public service corporations were meeting the first and most urgent demand of the nation for transportation, light, power, etc. The fact is, the people have changed their point of view. Their right, both in morals and in economics, to do so need not be questioned. The fact of real importance is this: as they have acquired a new point of view, they should allow the public service corporations sufficient time and opportunity properly, and without undue hardship, to adjust themselves to it.

Expediency demands this. We might say justice also; for a community has no moral right to encourage a corporation to perform an act which it subsequently stamps as wrong and then penalize it for that act. But we are content to put justice out of question for the time being. Expediency alone should be a sufficient deterrent. Or if "expediency" has a sinister sound, let us say "prudence."

Now, there are several things which prudence teaches a man. One is, that rights are apt to clash in this world, and that when they do clash, each possessor of rights must waive part of his claim. In other words, it is never possible for the shrewdest or strongest person to acquire his full rights, and such a person is generally the first to see the necessity of compromising; he is bound to let others

do what in the abstract he condemns in order to get the largest attainable good for himself. Another thing that prudence teaches is that industry abhors violence as nature abhors a vacuum. An industrial enterprise whose chief characteristic is immorality should be suppressed at one blow if possible. A lottery, for example, is a business which, we are all agreed, is entitled to absolutely no consideration. But when the industry is in itself legitimate, it is the height of folly to crush it to the earth for the mistakes of its managers; especially, if the things complained of have been condoned for years by the community.

A large part of the industry of this land has fallen under the disapproval of the public, for one reason or another. The public claim that they have been dispossessed of their rights by the corporations conducting this industry. It is not our purpose to argue this claim. The salient fact is that the public, at the moment at least, seem disposed to pass drastic legislation for the purpose of curtailing the initiative of public service corporations. Conceivably, the changed times call for restrictions on the freedom of such corporations. Yet it is well to bear in mind that such a course has its dangers for the public. The corporations will not be the worst sufferers if the task is not performed with discretion. The aim of the public now is, in the public's own words, to make the corporations give the people their rights. The corporations will for the most part, we are convinced, attempt to fulfil to the letter whatever laws may be passed. But great evolutionary, or if you please devolutionary, processes cannot be checked suddenly without danger. The public should bear in mind that in industry there is such a thing as momentum. A large body moving with great velocity through space cannot be brought to a sudden halt without catastrophe.

It is sometimes necessary to take things as we find them in this world; or at best to change them as opportunity offers. That is just the point of this whole discussion. In morals, one can and should be an idealist. In economic affairs, one must, if one is going to accomplish anything and get anywhere, be an opportunist. This word has a large and fine meaning, as well as a small and base; and it is with this meaning that we use it here. The individual should be an idealist in his desire for his absolute rights as a factor in the economic scheme of the nation, but he should be an opportunist in the methods he employs to get what he considers his just due. Idealism is productive of but few mistakes

in the realm of morals. In the past it has been productive of many horrid mistakes in the realm of economics. Yet today, the American people are enacting vast amounts of hasty legislation for the correction of corporations, with little real knowledge of the consequences.

The situation does not call for a priori treatment. It calls for anything but that. What it really demands is a patient, painstaking, cold-blooded investigation of facts, and a cautious and gradual application of such measures of reform as the facts seem to warrant to those best capable of understanding their meaning. The industry of this land is the bridge by which the nation has crossed over from poverty to prosperity. It may be that a different kind of bridge is now needed. Yet there is this to be said: A community does not usually tear down an old bridge before it has erected another structure to perform its work.

INVENTIONS AND INVENTORS

By L. B. BUCHANAN

A proverb says: "Who live in glass houses should never throw stones"; but another equally ancient saw says: "Turn about is fair play." If one rigidly adhered to the first precept the world would lose the benefit of kindly criticism, for the carping of the small number of nonvitreously domiciled would be disregarded, as being the wail of the incompetent. He who is unassailable must have done very little and never have departed from the beaten track to the field of the original.

Since the Patent Office records would show the writer to be an unimportant inhabitant of the brittle and transparent structure (not even wire glass) described in the first proverb, he feels that he is acting under the scope of the second when writing what follows, as his own acts are open to the attack of others.

Since 1893 there have been brought to the attention of Messrs. Stone & Webster several hundred inventions, and without doubt five hundred or more different inventors have called at their office. It has been the writer's privilege to examine most of these inventions and to talk with their progenitors.

To afford some idea of what has been presented, a very incomplete but widely diversified list is here given: Several circuit breakers and switches; arc lamps with anywhere from one to five electrodes; arc lamp carbons with innumerable cores and exterior platings; electric heaters of various kinds, some alleged to give more than one hundred per cent. transformation of energy to heat; copper claimed of one hundred and fifty per cent. conductivity; dynamos of abnormally high efficiency; dynamos of constant e.m.f. at variable speed; primary batteries, several alleged to consume no material, one in particular which used the ocean as an electrolyte; methods of deriving electricity direct from coal; self-multiplication of energy by "self intensifi-

cation in inductive circuits"; production of energy from the "theoretic principles of the atom"; electrolytic processes for chlorine, soda, barium compounds, carbon bisulphide, electro silicon, phosphides, alundum, chloroform, nitric acid, nitrides, hydrochloric acid, and several other things; methods of making gold from lead, platinum from tungsten, tin from coal; innumerable railroad signals, safety appliances, car fenders, trolley wheels and retrievers; two dozen improvements in paper making machinery; drying machinery; spools; small electrical fittings, fuses, bushings, etc.; machine and bench tools; machines for separating minerals; peat machinery; electric railway switches and means of operating them; electrical instruments; paper cloth; method of preserving eggs indefinitely; wireless telegraphy methods and apparatus; disc dynamos; steam turbines; recovery of paper stock from cotton seeds; automatic gas lighters for street lamps; magnetic brakes and traction devices; spinning machinery; cotton gins; lightning rods and means of testing same; storage batteries; humidifiers; acetylene machines; a corn breakfast food; mantle gas lights and gas machines.

Some of these, as is apparent, were the efforts of a disordered brain or the product of that little knowledge which is dangerous. Some were ingenious but impractical; some were possessed of great merit, but of no interest to Stone & Webster; a few have been taken up and exploited, those which proved successful being sufficient in number to amply warrant continuing investigation of new ones at the present time.

The inventors include a wide class of men, and may be divided for the present purposes into five classes,—insane, ignorant, normal, engineer and fake.

The insane inventor needs no extended description,—he is usually harmless, being a nomomaniac on his pet theory and is very often possessed of exceptional knowledge of science and arts. I remember very well one with whom I spent the best part of a day listening to his explanations which did not explain. He was a mathematician par excellence, and his knowledge of mathematical electricity approached the order of a Maxwell or a Steinmetz, but he denied flatly the first law of thermodynamics and, while irritated beyond measure at my stupidity, was exultantly delighted when, at the end of the tedious afternoon, I consented to take oath to a statement that never in my knowledge or belief was, or could be, one mechanical horsepower transformed into more than seven

hundred and forty-six watts of electrical power, errors of the gravitation system and of measurement disregarded.

Another poor man could not tell me coherently what he had invented, and I only succeeded in dismissing him by asking him to put it in writing, which he promised to do, but has not, so far as I know, though eight years have elapsed.

The ignorant inventor has generally attempted to absorb a learned work in physics or chemistry in a short period of time. Being without foundation in the fundamentals, he has misconceived the principles underlying science, and has worked under his own constructions of these principles which are of the "fearfully and wonderfully" kind. Such men believe that they obtain gold from lead, or that a zinc and a carbon plate immersed in the ocean will supply energy indefinitely. One of these metal transmuters presented a newspaper account of the recent researches on radium, and the degradation of copper, regarding which the illustrious Ramsey has recently written, as positive evidence that he had made gold from lead or some equivalent transmutation. It is but fair to say that often these men find something really good, but it must be looked upon as a fortunate blunder, rather than otherwise, though that does not detract from its value to the world.

The normal inventor is generally keen, ingenious, egotistical, suspicious and erratic. He believes in his invention, he knows its strong merits, he is quick to invent on the spur of the moment improvements which he believes will overcome any objection one may make as to the practicability of his idea. He knows he knows more about the subject than anyone else. He believes that in any negotiations, the capitalists are against him, though he knows that he must deal with them in order to launch his scheme. He generally has no idea of business or business methods, and is usually the worst person to put in charge of commercial development of his project. Experience has shown that working agreements with him must be clear and definite, and such documents couched in the necessary terms excite his ire, as being in his estimation all in favor of the capitalist, and against him. With tact, however, he can be and is satisfactorily dealt with, and to his ilk we are indebted for most of the spontaneous original improvements that have hastened our progress.

By what I have designated as the engineer inventor, I mean a totally different individual from the last. This inventor generally lacks the spontaneous ingenuity of the normal class; his inventions are the result of observation and logical deductions. Frequently, while very valuable they are special improvements upon ideas already in use or a combination of well-known methods and processes. The distinction is made between trained thought and concentration as contrasted with the flash of genius. Of course all classes overlap to a certain extent and merge the one into the other, but I think there is a marked difference between the engineer and the rest. The word engineer was selected because it has been my experience that this class of inventors are almost invariably engineers. An engineer is not necessarily a technically educated person,—there are natural engineers who never saw a school. I believe the term to cover all who govern their useful acts by the dictates of common sense, who work from the data at hand and not They formulate a conclusion from definite though often times necessarily deficient premises, but they rarely jump at a conclusion. When guess they must, their guess is influenced by the weight of at least some attendant circumstance, and is not, except in rarest cases, like the flip of a coin.

It is through this characteristic that the engineer inventor invents; and unlike the others, he is for the most part modest, inclined to belittle his personal effort even if he appreciates the result. He thinks anyone of similar training would have done as well as he, if they had had occasion to work upon, or think about, the same problem. Unfortunately, he is often dilatory in perfecting his idea; he thinks it not worth while; inventors are a crazy lot, anyway, he has other things to do more important, some time he will do something about it, if he has time; and while thus procrastinating and occasionally disclosing it to friends, someone surreptitiously appropriates it, by filing an application in the Patent Office, and obtains the patent which should have been his.

The fake inventor, I regret to feel obliged to mention: he is never an inventor except of ways to deceive, but as he poses as such and endeavors to interest the promoter, a little must be said of him. It is he who proposes to light one hundred or one thousand lamps with a ten light dynamo by the use of an electrical distributor, each circuit having ten lamps; he can obtain fabulous wealth from the gold in sea water, he can generate power at no cost by liquefying air, he can render gasolene, kerosene, etc., non explosive without making them incombustible, and a host of other similar things. Or he may present as new, an old and discarded method, depending upon ignorance of the capitalist and skillful

manipulation or absolutely dishonest demonstration to extract the lucre he desires. He is a wilful fraud, being thus distinguished from the ignorant inventor, who often causes financial loss to the unwary, though absolutely honest in his erroneous belief, and who is often the worst disappointed person connected with an unfortunate venture.

The fake inventor keeps away from reputable engineering houses; it is often only through the caution of intended victims that examinations are made which prick the bubble, and the efforts to avoid such investigation on the part of the faker are often ludicrous.

The fact that there have already been granted in the United States about nine hundred thousand (900,000) patents and that there are insane, ignorant, and fake inventors should not deteranyone from attempting to patent a new idea of presumable value, and the sooner after conception practical trial is made, the sooner the application can be properly filed and protection secured.

CAPITAL AND PUBLIC SERVICE CORPORA-TIONS

There are some people who profess to believe that it is very wrong for any public service corporation to be operated for a profit; and yet the manager is forced to give first consideration to the profit, because if there is no profit the thing will not be done at all,—no one will furnish the capital that is necessary.

With this profit in mind the manager is having his troubles in these times of high prices for labor and material, increasing taxes and burdens imposed by the municipalities, and decreasing rates for service. There is a strong incentive to make up for these losses by strenuous efforts to increase the gross business, in the hope that a smaller margin on a larger volume of business will still leave final conditions nearly the same. It is true that it may be only in this way that improvement can be made, but the manager may easily run into a still worse difficulty if the return necessary to attract the new capital required for the new business is greater than the earnings from the new business.

Thanks to the rosy stories of promoters and the extravagant statements of corporation opponents, the popular idea is that the profits in the business of public service corporations is very large; but as a matter of fact, the desirability of investments in street railways and lighting companies comes more from the probability of their stability than from their size.

There is very little public service business that can return to the investor as much as he can get now by lending money on good security. With strong corporations paying 7 per cent., and even 10 per cent. for money, the public service corporation can make no profit by extending service, and the prudent manager will cut down as far as possible all new capital expenditures for extensions and additional service until either the investor is satisfied with a lower return or the taxes and expenses show some signs of lessening.

New gross earnings always seem like a real gain, but it will always be found that sooner or later \$1000 of new business requires new capital expenditures of \$3000, \$4000 or \$5000. In these times the company is fortunate that can save from \$1000 of new business, after paying operating expenses and allowing for depreciation, \$250 to distribute to those who furnish the money. That would give the investor 8 1-3 per cent., 6 1-4 per cent., or 5 per cent. according to the capital cost, and that is not enough to attract the money now

"AS OTHERS SEE US"

A gentleman, formerly officially connected with one of the large street railroad corporations of the country, but who, for a number of years, has been engaged in other business, though still maintaining his interest in the growth and development of street and interurban railway enterprises, having recently made a rather extended tour of the West and South, partly on business and partly on pleasure bent, visited en route a number of the companies forming a part of the Stone & Webster aggregation, and we are glad to quote from a letter recently received from him as follows:—

"The organization in charge of the various roads impressed me greatly, as also did the fine, flourishing condition of the properties and their future. Never have I met men more loyal to and more enthusiastic in the praise of their employers than those in charge of the Stone & Webster properties. The same spirit seemed to prevail with all the employees I met."

Boston, August 21st, 1907.

THE SECURITIES DEPARTMENT

BY THE DEPARTMENT.

The Securities Department of Stone & Webster's organization was established in 1902. At that time there were thirteen operating companies under the management of the firm. The bonds and stocks issued by these companies amounted to \$36,893,000. At the close of 1906 the number of companies operating electric railway, electric lighting, gas and water power properties had increased to twenty-nine, with bonds and stocks issued amounting to \$105,249,000.

The following comparisons of earnings and expenses of the companies shows the growth of the business of the firm during the five years of the Securities Department's existence.

Combined Statement of Companies

	1901	1906
Gross Earnings	\$4,127,830.00	\$13,410,779.00
Operating Expenses	2,652,074.00	8,361,897.00
Net Earnings	1,475,756.00	5,048,882.00
Interest Charges	623,143.00	2,035,951.00
Balance	852,613.00	3,012,931.00
Dividends Paid	•	1,196,798.00

Disbursements of interest and dividends in 1901 amounted to \$812,143. In 1906 they amounted to \$3,232,749.

In the earlier days the financing of companies and the distribution of the securities issued by them, was largely through the medium of bankers, who took large interests in the bond and stock issues when the companies were organized, placing them with investors through their established channels. rapid acquirement of new properties, and the organization of new companies, the financial details involved made imperative the creation of a specialized department to handle these matters systematically; also to be the official source of information concerning the companies, their securities and physical data. The Securities Department was thus organized, and centralized the work which heretofore had been carried on by members of the firm and by various departments. The increase in the number of companies managed, and the wide distribution of the securities sold by them, soon led to closer relations with investors who held these securities, and stimulated direct inquiries from a wide-spread investing public who were attracted by this class of investment. To meet these inquiries, and to handle the financial transactions involved, the department was organized for the following purposes:-

Acting as financial representative of the companies managed and financing all new companies when organized.

Anticipating and providing for financial needs as the companies require new funds for development and extension.

Acting as brokers in the interests of institutions and individuals for the sale and purchase of securities of the companies.

Preparing detailed data in connection with the financial and physical condition of each company.

Recording daily returns of gross earnings of the companies, with comparisons with the previous year.

Publishing monthly statements of the companies, showing earnings and expenses for each month and for twelve months, with comparisons with the same periods of the previous year.

Publishing yearly a manual giving information about the companies that is most commonly desired, including statements of earnings and expenses for the previous year.

In the years which have followed the establishment of the Securities Department, the business passing through it has grown to large proportions and has led to the establishment of a branch office in Chicago. The increasing confidence in the stability and intrinsic value of the securities of well and permanently managed electric railway and lighting companies has led to a very large and wide-spread absorption of such securities by institutions and individuals who have found by experience that, while yielding satisfactory investment returns, they are not susceptible to the extreme

fluctuations in values which at times of unsettled financial conditions affect securities which are speculatively traded in. The conservative nature of the investment buying of well established and permanently managed electric railway and lighting securities is in itself a strong guarantee of their stability in trying times.

RAILWAY OVERHEAD REPAIRS

The monthly letter of a manager explaining expenditures for July makes a note of the cost of converting a discarded passenger car into one for line repairs and renewals, and as this item forms a considerable proportion of the total overhead maintenance of the company for the month, it furnishes the suggestion that perhaps there is room for somewhat more thought and care on the part both of superintendents and of employees in the matter of line troubles and the costs involved therein.

There is no line of business in which so large a proportion of the gross earnings go back to supervision and labor as in electric railroading, and if "eternal vigilance is the price of dividends," economies that can be worked in "time sheets" in this matter of overhead repairs, as well as in all departments of the company's work, must not be overlooked.

The average cost of line maintenance for an electric railroad per mile, as compared with that of track on the same basis, is as one to five, and is very much less than that of cars and their equipment, using for the latter the vehicle as a unit. Thus the comparative insignificance in point of total monthly or yearly expenditure may perhaps lead to less watchfulness of the up-keep costs of overhead line work than is given to the necessarily larger outgo for other portions of the road's equipment. Granted it costs ten thousand dollars to build a mile of track and only twenty-five hundred for a like distance of trelley and its fittings, it does not follow that the manager or superintendent in his constant effort for a close hauling of expenses along the various lines of up-keep, or the trainmen in their use of the company's equipment, should give to the overhead line work their time and care apportioned on a similar basis. In electric railroading, it is plain that it is the small things in every department that possibly contribute to the doing of the work that makes for the greatest success of the completed whole.

The numerous variety of breaks and the endless number of causes requiring the attention of the overhead construction and repair forces of an electric railroad, need no end of investigation and suggestion to reduce or remedy the troubles in this department. The wire breaks alone are a conundrum, occurring, as they often do, in a most surprising manner. Sometimes the break will happen some little distance in front of a car, with no apparent cause, and No. 0 wire seems to part as easily as No. 4, while at the point of breakage the wire will appear to the examiner as sound as anywhere else.

A number of breaks are traceable to fastenings or clips at which the wire is worn by the trolley. The remedy for this sort of trouble must be found with the patrolman, who, in his work as overhead track walker, should have a sharp eye for the straightening of clips and the lining up of the trolley.

A cause which probably accounts for some peculiar breaks, is the frequent practice of pulling the trolley from the wire while the controller switch is on. This causes a vivid spark, which burns the wire and weakens it at this point, so that a blow from a following car severs it.

Wire breaks at switches and crossings are caused by the continual thumping which they receive from a trolley passing from wire to switch, and the faster the car crosses these places the heavier the blow received. While breaks of this kind are perhaps unavoidable, much can be done by a proper handling of the cars.

The average conductor or motorman would resent the statement that in the main the line department was maintained to right the results of his carelessness. Yet this is largely true. Neither automatic trolley catchers nor electric switches will make good want of care on the part of trainmen in passing points where caution is to be observed, and trouble at such places not only means emergency repairs, but also permanent work of repair men to readjust and bring the deranged switch or wire into place, involving the use of heavy tackle and much time.

In the central part of a system, where curves, turnouts, etc., are numerous, the need of caution to prevent trolleys from tearing frogs out of place cannot be too strongly impressed upon trainmen, as the overhead work in these places is often balanced by the strain of the curves at the different corners, and a heavy pull from a trolley caught in a span on one curve will affect the other at the further block equally as much. The sight of a crowded car during

the rush hour, stalled on a curve, an overhead switch loosened or trolley broken, a span-wire hanging and the entire line structure swaying as though about to come down, the impatient passengers in stopped cars venting their vexation in the usual fashion, is one which a manager cannot view with complaisance, either on the score of convenience to those whom the company serves and whose good opinion it desires, or on the score of expense for repairs for the break or the large call for power which the starting of the blockade entails. And yet such an occurrence almost always is due to a want of care on the part of some employee. To be sure, trolley wheels will jump from their appointed track and the cause of such a vagary on their part is puzzling, but there is a cause and it must be discovered. To construct an overhead system so as to prevent the wheel from leaving the wire is almost impossible, for there are other reasons for the jumping of trolley wheels, aside from those residing in the overhead structure. The wheels themselves, the bases, the track, the springs on the cars, the tension of the pole, all have their important functions in the correct operating of a trolley wheel. A bad spot in a rail, if close to a pole where the wire is held rigid, will often throw off the wheel if the car is travelling at average speed; badly adjusted springs on the carswill have a similar effect, especially on an imperfect track or where there is a crossing, switch or crossover, and other causes of the trouble are a weak tension spring, a hard working switch which causes the trolley to jump on the straight run instead of guiding it to the curve wire by the turning of the car, and, perhaps worst of all, a bad trolley wheel. All these different sources of trouble and consequent expense can generally best be located by the men operating the cars; and hence it follows that it is of the most importance that the officials, whose duty it is to instruct and supervise trainmen, impress upon them the necessity of discovering and reporting the causes leading to overhead troubles. It has been the writer's habit in preparing blanks or cards for defect or accident car-reports, to have the cause given in a space headed by the word "WHY" in large capitals, in order to call attention to the fact that the cause is the very meat of the report. To be apprized of the occurrence is important, but its reason is the essential factor to a perfect diagnosis of the case, as precedent to the application of proper remedies. To report line trouble as "trolley does not follow," gives little or no clue to car or line repairmen. "Slow" signs at dangerous points are useful, and bulletins in the trainmen's room, pointing out points on the line where trolleys may jump unless speed is slackened and the conductor gives attention to the trolley rope, should frequently be posted.

The rule of care and watchfulness in the use of apparatus is only second to the rule of care and politeness in the treatment of passengers and the public, and these two constitute the whole law for street railroad operatives. In proportion as a manager induces its intelligent observance on the part of employees, will public favor be cultivated and disbursements for accidents and repairs decreased. The latter are the important variants in the equation of a railroad's life and operation.

PREFERRED STOCK AS AN INVESTMENT

BY THE SECURITIES DEPARTMENT.

Preferred stock as an investment is so new as compared with mortgage bonds or securities of that nature, or as compared with capital stock where no preferred stock exists, that its merits are not yet thoroughly understood or appreciated by the investing public.

During the last few years preferred stock has been issued and sold to such an extent by all classes of corporations for the purpose of raising funds to pay for extensions and improvements, that a brief description of its characteristics may be of interest.

A preferred stock is so called because it is entitled to dividends from earnings before anything can be paid on the common stock, and because in case of liquidation it participates ahead of the common stock in a distribution of assets. The voting powers of preferred and common stocks are usually equal.

Two distinct types of preferred stock are in common use: first, "non-cumulative," and, second, "cumulative." A non-cumulative preferred stock is entitled out of the net earnings of a company to dividends of a fixed amount per annum before any dividends are set apart or paid upon the common stock. If, however, the earnings during any dividend period are not sufficient to justify, in the opinion of the board of directors, a dividend payment, such dividend is non-cumulative; that is, the company is not obliged to make up the deficiency in the future before paying dividends on the common stock. A cumulative preferred stock, on the other hand, is not only entitled out of net earnings to dividends of a fixed amount per annum, but if, for any reason, a dividend should not be paid when due, said dividend becomes cumulative; that is, the deficiency must be paid out of earnings of subsequent years before any dividends are set apart or paid upon the common stock.

A cumulative preferred stock is, therefore, other things being equal, a more attractive investment than a non-cumulative pre-

ferred stock, for the principal reason that even the strongest corporations may be forced at times to pass a dividend on account of such misfortunes as a bad fire or a strike of employees. Fortunately, such misfortunes occur rarely and the non-payment of preferred stock dividends is seldom heard of.

It will be readily seen from the foregoing that preferred stock is a more secure investment than common stock. Compared with mortgage bonds its attractiveness as an investment lies chiefly in its higher return to the investor, as its customary rate of dividend is 6 per cent. per annum, while the usual rate of interest paid on bonds is 5 per cent. per annum or less. This advantage to the investor in dividend rate over interest rate is entirely natural, and is due to the fact that mortgage bonds have a direct lien on the physical property owned by the company, and a first lien on an amount of the net earnings sufficient to cover their interest require-The secondary security of preferred stock to bonds is offset by the larger return to the investor, and also by the important fact that it has a direct voice in the management of a company through its voting powers, whereas bonds have no such advantage. In this connection, a stock is rightly called "a certificate of interest," and a bond merely "an evidence of indebtedness."

The use of preferred stocks by corporations has increased rapidly, particularly in the last few years, during which the growth of the country has necessitated tremendous expenditures of money for extensions to properties of all kinds, such as steam railroads, electric railways, lighting plants, mills and factories. many years ago funds for such extensions would have been raised almost entirely by the usual method of placing a mortgage on a property and selling the bonds secured thereby, or by issuing notes or debenture bonds payable in a certain number of years. Quite recently the plan of issuing and selling preferred stock in order to raise additional capital has been so generally adopted that very few corporations are now organized that do not have the right to issue both preferred and common stocks, as well as the usual mortgage bonds. In many cases the security of preferred stocks of well managed companies today is much greater than the security ten years ago of first mortgage bonds.

This method of raising a large proportion of all moneys needed for additions and improvements to properties by the sale of preferred stock has many beneficial effects: the security of the bonds is enhanced, thus enabling the company to obtain a better price for them when it wishes to borrow by this method; the mortgage debt is kept down, thus preserving and strengthening the company's credit, and the money is raised for all time, as stocks do not mature like bonds and notes. Also the issue of preferred stock offers an excellent opportunity to the investor to take an interest in a company with safety, and at the same time obtain an income greater than possible from bonds.

SIMPLE ELECTRIC LIGHT RATES

BY NORMAN T. WILCOX.

The writer for one believes with "an ex-manager," as expressed in the article "Simple Electric Light Rates" in the August issue, that most of the rate sheets now offered the public are needlessly involved and fussy, and that from the standpoint of self-interest and broad public policy, we should adopt the simplest system of charging that is feasible. The whole problem of rates seems complex and hard of satisfactory solution, and from the nature of things much must be left to the law of general average. Human nature, which underlies all motives of personal action, is and will remain much the same the world over. As the Millenium does not seem to be anywhere near at hand, and as lamps and other devices will persist in using more current when a larger unit is put on the socket, or customer leaves his cellar switch on upon shutting up his house to go off on an extended vacation, we shall continue to be confronted by the practical necessity of providing a recording wattmeter, to avoid criticism of our monthly fuel and renewal accounts when they are forwarded to headquarters.

The new high efficiency lighting appliances, fortunately now coming to our aid, even with their remarkable efficiencies, do not remove the difficulties mentioned.

The problem would be more easily solved if we had a more simple commercial way for recognizing capacity, quantity and time of use.

If a satisfactory, reliable and simple meter could be devised that would automatically compensate for these variables, we could make one, or at most two, flat meter rates and approach the public in an ideal way. May be some day a genius will solve this difficulty, but the solution does not seem to be imminent, the nearest being the crude two meter system with its eight day hand-wound or useless battery-wound clock, to change the records from high to low rate, with no recognition of Kw. capacity at all, or, on the

other hand, the old-fashioned simple flat rate contract charge plan, which does not seem admissible.

The lighting rates may be practically provided for by an average meter rate for all except the long hour users in the business district, and for these we would provide a minimum charge per unit of capacity, varying according to capacity required, plus a small meter Kwh. charge common to all customers of this class alike.

The minimum or flat charge would be simple, varying according to the size of installation, while the resulting Kwh. rate obtained from this combination of the old flat rate and the later meter rate system of charging may be another one of the practical illustrations, so often occurring in business and politics, that "The middle way is best" or at least most practicable.

It will be noted that the terms "service charge" "maximum demand," etc., are not used, as the simpler term "minimum charge" is more satisfactory and to the average man less likely to suggest unnecessary questions and explanations, a distinct advantage in dealing with the general public.

The plan of using the set minimum charge, plus the meter Kwh. charge, automatically results in a net Kwh. rate which at all times is fair and equitable, and being such will not result in the inevitable occasions for friction which must attend any matter which is not settled right. This plan is not perfect, as it does not recognize the time at which the service is required, but may offer the best obtainable present solution of the problem, and is offered in the hope that it may help to get the whole rate matter in a much more orderly and satisfactory condition. This plan can be readily adapted to the one Kw. customer for whom we may have an investment for distributing system alone of \$125 or more per Kw. of maximum demand and corresponding large charge for upkeep and attendance, or to the large wholesale user of motor current for whom we are obliged to make an investment of maybe only \$30.00 per Kw. of maximum demand, and who, owing to simplicity and shortness of line, etc., may actually require only a nominal charge for upkeep and attendance.

By all means make the rate plan as simple as possible and let us get to a proper basis quickly, but let us not forget that the old flat rate contract plan was abandoned because of its manifest imperfections, which still exist and are likely to remain for a long time to come.

ARTESIAN WATER FOR BOILERS

D. VALENTINE.

Artesian well water for boiler feed purposes, especially in the South and Southwest, is a subject worthy of more than passing notice. Not only have you to contend with the impurities, as shown by analysis of the water in the stratum to which your well is sunk, but this water is liable to be impregnated by the water from different strata above or below, unless you go down to the stratum giving the greatest head. This is true no matter how carefully or perfectly you may case off all the water bearing sands you pass through before reaching the water desired.

Before putting down a well to secure water for boiler feed or any other purpose, it is advisable first to ascertain the number and depth of all the water bearing sands underlying the surface in your locality and if possible get the analysis of water from all of them; from these analyses select the one apparently the most suitable for your requirements, and if you have to use artesian water go down to the stratum selected regardless of first cost. A flowing well is always more to be depended upon, if properly cased to give a supply of water that will not be impregnated by water from any of the strata above it, than any well that has to be pumped. For example, here in Dallas we have a number of water bearing sands each giving widely different analysis. First, we have what is called the upper Woodbine at a depth of about 650 feet; this is practically useless for boiler feed purposes on account of being overrich in alkaline salts, enough to cause foaming in a tea kettle. Next, we have the lower or true Woodbine at a depth of some 850. feet. This water is some better than the above and is the water we are using for all purposes in our Dallas plant. Of this water I will speak further. Next comes the Paluxy stratum at a depth of 1550 feet. A well driven to this stratum will flow with a head of from 35 to 50 lbs. Water from this stratum is much better for boiler feed purposes than that from the Woodbine sands, and we are now completing the sinking of a well to get this water. Next comes the Glenrose stratum at a depth of 1900 feet. yield a large quantity of very strong mineral water at high pressure, the water being exclusively used for medicinal purposes. Right here I will tell you what tricks this mineral water has played on us, as well as on the railroad companies, and others. A well was put down at the city water works; they passed through the Woodbine and Paluxy sands, but did not properly case off the Woodbine, the result being a flow of mineral water from the Glenrose well into the Woodbine stratum, so impregnating it with mineral salts as to set up a rapid corrosion in our water lines; the corrosion would assume a line in the upper inside surface of the pipes. In a 5 inch pipe this line of corrosion would be about 1-2 inch wide and would eat clean through the pipe for its entire length. same well hole was driven down to the Trinity sands. The water from the Trinity became mixed with the mineral water and was carried into the city reservoir, and so got into the locomotives and was the cause of much trouble and complaint from the railroad companies. Finally the mineral water was harnessed and kept from flowing into the other stratum which has less head, and the trouble from this cause came to an end. From this it will be seen that no matter how careful you may be in casing off the undesirable water, unless the other fellow is equally careful, the water in a well having its stratum head below the surface is liable to be impregnated through imperfect casing of other wells by water from other strata having a flowing head. In the case spoken of above the head was 100 lbs.

Speaking of the behavior of the water from the Woodbine sands under actual working conditions. I will say that it would be hard to find a water so nearly useless for boiler feed purposes and yet water able to be used for such purposes.

I remember that four years ago the greatest difficulty was experienced in lubricating the cylinders of two cross compound Hamilton-Corliss engines. A set of bronze packing rings weighing 700 lbs. would wear out in about three months. This was a 50 inch low pressure cylinder, while the high pressure cylinder would be scored and packing rings wear out quite frequently. We tried some of the most expensive oils on the market; but it seemed that no matter how much we used, the cylinders would be dry when opened up. The trouble we knew was caused by the alkali in the water, which would come over with the steam in a very light

foam, not enough to show any external indications of foaming, but enough to cut off the mineral oil from the walls of the cylinders. At the time we decided to make a change we were using "600 W." cylinder oil, which I have used at other places with very good success. Finally we got our oil dealer to make us a special brand of cylinder oil very highly compounded with animal fat, which I should be loath to use in any plant where I have been before. However, with the strong concentrated lye that came over with the steam and with the animal fat we had in our cylinder oil, we thought that when the two came in contact in the cylinder they would start up a little soap factory, which proved to be true. The cylinder oil thus compounded cost us 20c. per gallon less than before, and we have since had no trouble from lack of lubrication in our cylinders.

However, we still have many other troubles from this water, mainly the scaling up of the feed lines between the heater and the boilers—the filling up of the heater tubes with a hard sandy scale, the scaling of valve stems and seats making it impossible to use After standing open for a very short time they have to be taken out and pickled. This all takes place after the water enters the heater; before it enters the heater its effect on the valves is entirely different. Any standard make of gate valve having iron gate with brass screw, if in use four or five months, will have the thread in the iron gate eaten away, and the valve is useless. the water gets in the boiler it again acts differently. We have absolutely no scale nor pitting of tubes, the tubes being as good and clean today as when first put in; but the alkaline salts will come out of the cap joints and cover the whole of the headers within a week, when a cold water test of 200 lbs. reveals no leaks. We find it necessary to blow down our boilers four times a day and to clean the boilers entirely once a week. The water we get from our boilers would make good boiler compound for removing scale, being so highly saturated with alkaline salts. With all this, however, we think we are fortunate in not having scale in our boilers. The troubles spoken of are more a menace to the operating forces than an expense to the company, as compared with a boiler coated with even a light coat of scale. So we are thankful that the scaling tendencies disappear when the water enters the boilers.

AN EMERGENCY INSTALLATION

BY L. H. G. BOUSCAREN.

Toward the latter part of the past winter a succession of events in Galveston created a sudden and immediate demand upon the Galveston Electric Company for an amount of light and power equivalent to about twice the rated capacity of its plant. Accordingly, on March 2, the Stone & Webster Engineering Corporation received authority to purchase and install a second-hand unit to meet this demand.

On March 12 a satisfactory unit was located in Pittsburg, Pa., in the shape of a four valve, 16 x 30 x 24 Pennsylvania Iron Works cross compound engine, direct connected to a 300 kilowatt, 2 phase Westinghouse generator. This unit was dismantled, boxed, loaded on cars and shipped from Pittsburg on April 1.

In the meantime preparations were being made for its reception in Galveston. It had been decided to place this machine, together with a 300 kilowatt motor generator, to be installed later, in a temporary building near the present power station. A number of test holes, sunk to determine the quality of the sub-soil at this place, revealed the fact that fine sand extended to a depth of 45 feet, and it was decided to drive a triple row of sheet piling in the form of a rectangle 22 ft. 6 in. by 38 ft., to excavate the interior of the box thus formed to a depth of 2 1-2 feet, and to fill the void with concrete, re-enforced with steel rails; thus forming a solid slab on which to build both engine and motor generator foundations.

On April 11, the driving of this sheet piling was begun. On April 20, the sub-base was completed. One week later the engine foundation was finished, and on the same day, April 27, the three-cars containing the engine arrived in Galveston and were placed for unloading.

The work of hauling the engine parts and placing them was-

comparatively an easy one. Large floats, used for hauling cotton, delivered the parts to a derrick which lifted and placed them in position. The work of building the temporary galvanized iron house over the machine, of extending the steam header from the old power house to the new, and the switchboard and wiring work were carried on simultaneously with the assembling of the engine. It was found that the high pressure cylinder needed reboring; this was immediately done. New high and low pressure bull rings and packing rings were cast and finished, new cross head shoes cast and babbited, both piston rods turned, piston packings rebored, and numerous broken or lost parts of governor and valve gear replaced.

In spite of these obstacles, steam was turned on May 26; the generator promptly seizing the opportunity to burn out a coil. On June 2 the unit was again in shape and carried its load successfully in parallel with the old station, making the time elapsing between date of authorization to buy and the date of first operation just three months.

At the date of this writing, the temporary unit holds a record of fifty-eight consecutive days of operation and is in every way a successful installation.

FROM THE AUTOBIOGRAPHY OF ANDREW D. WHITE

(PAGE 34, VOL. 2.)

De Witte's discussion of the whole subject was liberal and statesmanlike. Unfortunately, there was, as I believe, a fundamental error in his general theory, which is the old Russian idea at the bottom of the autocracy—namely, that the State should own everything. More and more he went on extending government ownership to the railways, until the whole direction and management of them virtually centered in his office.

On this point he differed widely from his predecessor in the finance ministry, Wischniegradsky. I had met the latter years, before, at the Paris Exposition, when he was at the head of the great technical school in Moscow, and found him instructive and interesting. Now I met him after his retirement from the finance ministry. Calling on him one day, I said: "You will probably build your trans-Siberian railway at a much less cost than we were able to build our first trans-continental railway; you will do it directly, by government funds, and so will probably not have to make so many rich men as we did." His answer impressed me strongly. He said: "As to a government building a railway more cheaply than private individuals, I decidedly doubt; but I would favor private individuals building it, even if the cost were greater. I like to see rich men made; they are what Russia most needs at this moment. What can capitalists do with their money? They can't eat it or drink it: they have to invest it in other enterprises, to be remunerative, must meet the needs of the people. Capitalists are far more likely to invest their money in useful enterprises, and to manage these investments well, than any finance minister can be, no matter how gifted."

(PAGES 37-38, VOL. 2.)

Many were the sufferers from this feature in Russian administration—this shirking of labor and responsibility. Among these

was a gentleman belonging to one of the most honored Russian families, who was greatly devoted to fruit-culture, and sought to bring the products of his large estates in the south of Russia into Moscow and St. Petersburg. He told me that he had tried again and again, but the officials shrugged their shoulders and would not take the trouble; that finally he had induced them to give him a freight-car and to bring a load of fruit to St. Petersburg as soon as possible; but, though the journey ought to have taken only three or four days, it actually took several weeks; and, of course, all the fruit was spoiled. As I told him of the fruit-trains which bring the products of California across our continent and distribute them to the Atlantic ports, even enabling them to be found fresh in the markets of London, he almost shed tears. another result of state control of railways. As a matter of fact, there is far more and better fruit to be seen on the tables of artisans in most American towns, however small, than in the lordliest houses of Moscow and St. Petersburg; and this solely because in our country energetic men conduct transportation with some little ambition to win public approval and patronage, while in Russia a horde of state officials shirk labor and care as much as possible.

Still another sufferer was a very energetic man who had held sundry high positions, but was evidently much discouraged. He showed me specimens of various rich ores from different parts of the empire, but lamented that there was no one to take hold of the work of bringing out these riches. It was perfectly clear that with the minister of the interior at that time, as in sundry other departments, the great question was "how not to do it." Evidently this minister and functionaries like him felt that if great enterprises and industries were encouraged, they would become so large as to be difficult to manage; hence, that it would be more comfortable to keep things within as moderate compass as possible.

(PAGES 454-455, VOL. 2.)

One more experience may be noted. In coming and going on the Moscow railway I found, as in other parts of Europe, that governmental control of railways does not at all mean better accommodations or lower fares than when such works are under individual control. The prices for travel, as well as for sleepingberths, were much higher on these lines, owned by the government, than on any of our main trunk-lines in America, which are controlled by private corporations, and the accommodations were never of a high order, and sometimes intolerable.

BANQUET IN HONOR OF THE RETIRING MANAGER

On August 6 the following order was issued by the heads of the departments of the Tampa Electric Company, as hosts, to the honore, guests, and heads of departments of the company:

TAMPA ELECTRIC COMPANY.

OFFICE MEMORANDUM.

Tampa, Aug. 6, 1907.

To G. W. Wells, Honore.

J. A. Trawick and E. B. Powell, Guests.

C. H. Byrne, T. C. Folsom, G. A. Webb, H. Nash, Jr., H. A. Hampton, B. M. Harrison, H. L. Stanley, L. P. McCarty, F. E. Fletcher, Hosts.

OPERATING ORDER No. 41144.

On Thursday, August 8, 1907, you will report at the office at 6.00 P. M. to pay your respects to Mr. Wells, who is going to leave us.

You are ordered not to eat anything from the time you receive this notice until Thursday night; also be a camel

You will not be allowed to talk shop from 6.00 P. M. on Thursday until the next morning, under penalty of being ejected from the festivities. Tell your wife—if you have none—so much the better—you will be home———.

Be on schedule time—do not get left at the switch. These orders must be adhered to to the letter.

By order

HEADS OF DEPARTMENTS TAMPA ELECTRIC CO.

I have given this matter my attention:

Name..... Date.....

And in obedience to the order, inasmuch as orders mean orders to the Tampa Electric people, due preparation was made for the

coming event by observing a period of fasting from the moment the order was posted until the banquet hall was reached.

Promptly at six o'clock on the evening of August 8, the tallyho pulled up to the door of the office, where the participants were waiting, and "All aboard!" was the order.

After a delightful drive along the beautiful avenues of the city, the party arrived at the Gran Oriente restaurant and were met and warmly welcomed by Mine Host Manuel Garcia, who immediately escorted them to his main banquet hall, where a beautiful sight and pleasing reception awaited them.

The banquet table and hall were artistically arranged and decorated with festoons of smilax and clusters of beautiful roses. The banquet table was appropriately arranged for the occasion with a most beautiful and artistic scheme of electric illumination, augmented by the floral effect. Each guest was assigned to his seat by an artistically engrossed frosted incandescent lamp, giving his name, under which the following most excellent menu presented itself; and upon the obverse side of the globe was engrossed the name of the guests and hosts, as shown in the following:

BANQUET TO G. W. WELLS. August 8, 1907.

Name MENU Cotel. Entremes. Vino Ring. Sopa. Frituras. Jerez. Pescados. Sauturnes. Aves. Asados. Espemante. Ensatada. Tortilla Rom. Mumms. Quesas. Frutas.

Tabacos.

Gran Oriente Restaurant.

Cafe.

Given by
Officials of The Tampa Electric Co.,
Tampa, Fla.

G. W. Wells

Guests.

J. A. Trawick

E. B. Powell

Hosts.

C. H. Byrne
T. C. Folsom
F. E. Fletcher
B. M. Harrison
H. A. Hampton
L. P. McCarty
H. Nash, Jr.

H. L. Stanley G. A. Webb

The effect of the illumination and decorations was both unique and pleasing, to be long remembered by the participants.

The good cheer, the things to eat and drink, came along in rapid fire order, as only our genial Host Garcia can have them come.

The very bountiful repast was interspersed by the delicious and refreshing wines that have been made famous by Espanol and Italy. It was good to be there, long to be remembered and never to be forgotten.

The fragrant havanas were handed around, and as the smoke was wafted upward the talkfest began and ended. Many were the expressions of regret for the parting of the ways, of appreciation for the courtesies and friendship, from all, for the man who was leaving us, wishing him that success in his new fields that his splendid virtues and qualifications should give him, and that the friendships formed during his association with the Tampa Electric Company should never be terminated, but would be a future bond for the good of all the participants.

"HIS HOUSE IN ORDER"

BY LEE H. PARKER.

During some periods in the history of most of our larger city electric railway systems there has been a deficiency of power. At those times it was often found necessary to shut down the shop motors, partially or fully turn off the car heaters, and economize on power wherever possible. The electric generators and often the entire power house equipment were frequently exposed to dangerous overloads; in fact, the service was seriously impaired.

If this shortage of power made it necessary to take off cars, or what results in the same thing, prevented the putting on of additional cars when there was a demand for same, the public and the press lost no time in taking up the matter vigorously, and we heard of applications for relief to the State Commissions, and municipal ownership leagues probably increased their membership for the time being. All of the "common people" who were not Socialists already, due to the "higher cost of living", soon became full-fledged Socialists during the period they had to hang on to straps in frigid and poorly ventilated cars.

One of the businesses of the Engineering Corporation is to investigate and thoroughly study power situations and make recommendations for their future development. The Corporation is fully prepared to assist the railway manager to put "his (power) house in order."

It is not considered good management nowadays to install new power machinery only after the demand for it is seriously evident. It is good management to foresee as far as possible the future power requirements and keep the power capacity at all times at a comfortable margin greater than the possible demand.

It is believed that, on account of the present state of the electrical art, it is impracticable to estimate the growth of load of any system for more than five or six years into the future. The estimates for future requirements for any particular system can be

Snow plows
Sprinkers
Sprinkers
Sprinkers
Coal service and other nonrev. service
Lighting Stations, Shops, etc.
Heating Stations, Shops, etc.
Ventilating Stations, Shops, etc. Av. wt. of cars
Av. schedule speed
Av. No. of stops per mile
Av. Time of stop
Av. Effic. Propulsion equip.
Av. Qurrent Area served General character and condition of service Georeal Business Activity Wealth per capita Attractions Foreign business Competition Av. Condition of track Av. Grades & Curves 4. Average weight of car; including average load TOTAL POWER LOAD OF "X" RALLWAY COMPANY Av. car capacity
Av. number of cars
Av. length of haul
Av. schedule speed Stone & Webster Engineering Corporation, Boston Consumed in opera-tion of Miscellaneous Power Uses 8. Revenue Miles per revenue passenger 2. Revenue pass. per capita 5. Watt hours per ton mile 1. Population Facilities for Handling Traffic During Rush Hours Watt hours per revenue pamenger Bevenue Passengers ANALYSIS OF Total K. W. H. output from D. C. Switchboard Load Factor right Ford ∰

best studied by taking as a basis the growth of load in the past for as many years as statistics are available.

The table opposite shows a fairly complete analysis of total yearly load, and also gives a list of the conditions and influences which tend to produce variations in the values of the elementary factors. These elementary factors are as shown on the table:—

1st—Population.

2nd—Revenue passengers per capita.

3rd—Revenue miles per revenue passenger.

4th—Average weight of car.

5th-Watt hours per ton mile.

Plotting curves of these elementary factors for the past years we are able to determine the trend and consequently the probable future increases or decreases in their values.

After determining separately the values of these various factors for the future five or six years, we are able to combine these values into the resulting total yearly outputs for this future period. In conjunction with a study of the future peak loads, or the load factor of the system, we are then able to determine what the maximum total Kw. load should be at any time for the future period.

THE STRINGENT MONEY MARKET

BY HENRY R. HAYES.

After such a decline as has taken place in the last six months in the value of securities, the many interested in such financial matters, in an endeavor to find the reasons therefor, find a study of values for the last ten months instructive and astonishing.

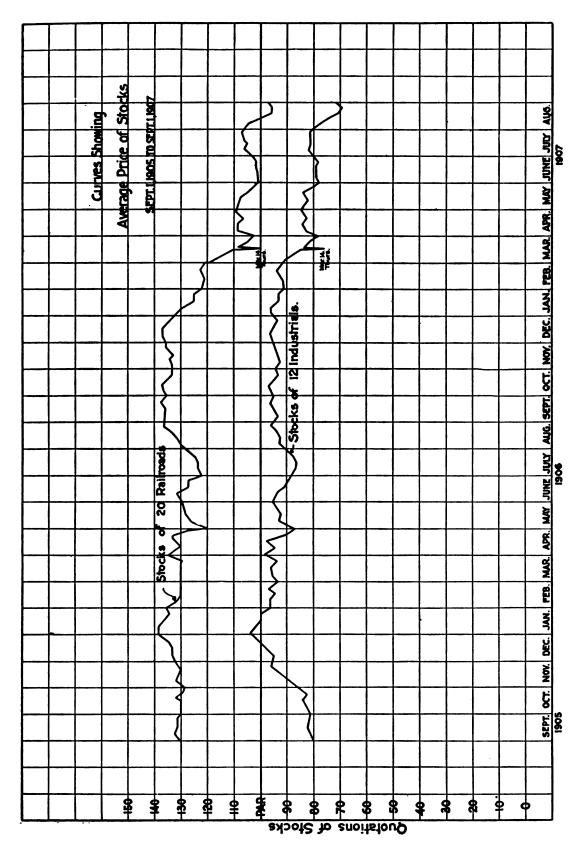
Never before in the history of this country have securities appreciated to the level reached in the fall of 1906, with the single exception of a short period in December, 1905, and January, 1906, and per contra, probably never before have we witnessed such a severe decline in so short a period.

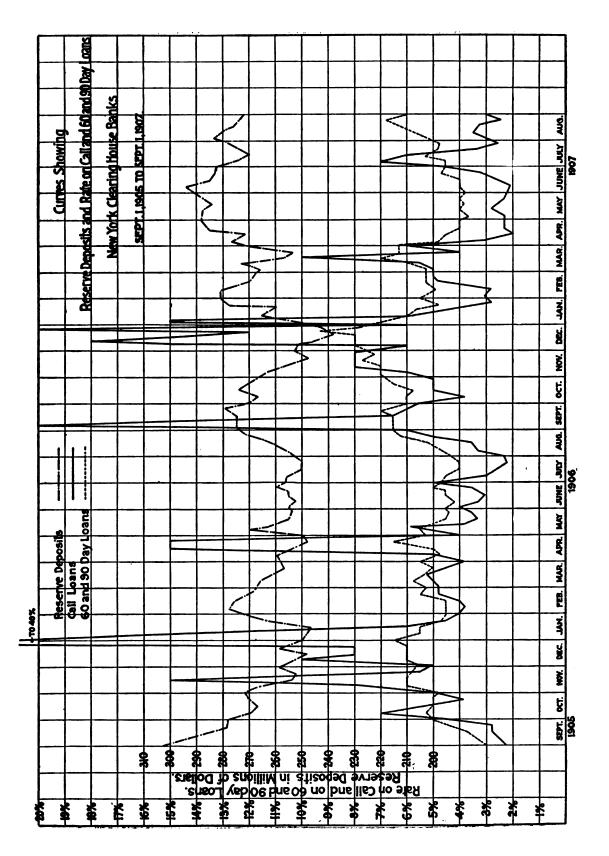
It is not intended at this time to discuss the reasons for this depreciation, but merely to present facts in a form which may be of interest.

The Wall Street Journal has for many years published daily a barometer of the stock market, which consists in giving the average prices of twelve industrial and twenty active railroad stocks in the United States and Canada. From such figures the accompanying curves have been prepared; and in addition, the New York call and 60 and 90-day money rates, with the combined reserves of New York clearing house banks, have been added.

Thoroughly to appreciate this decline, it should be borne in mind that practically no changes had taken place in the increased dividends paid prior to the last break in the stoc kmarket in the month of August.

A study of the curves of the money market may be found of more interest, as showing the tremendous strain under which this market has labored since the fall of 1905. It will be noted that the fluctuations which occurred during this period have been extreme. Let us suppose that operating expenses of a public service corporation were as unstable as money rates have been during the last two years. Such a condition, of course, would be hopeless for financing, and would consequently seriously affect





the value of the securities of the corporation. Precisely so has the strain on the money markets, whatever may be the causes, affected security values and general business. Anticipating this demoralization, Stone & Webster early this year issued orders concerning the companies under their management to reduce construction expenditures to a minimum, in order to improve the credit of the companies and put them in proper trim to weather any financial storm.

As a result of these strained conditions, we have witnessed depreciations in the value of stocks and bonds which have largely discounted actual conditions. To what extent this depreciation fore-tells the general conditions of business prosperity is, of course, problematical. Certain it is, however, that the tremendous business expansion which has taken place during the last few years has been temporarily retarded, and there now seems to have set in a period of retrenchment in almost all lines of business activity. Business concerns at the present time are engaged in handling the business on hand, and are not, generally speaking, extending their commitments to the future.

HOUGHTON COUNTY BANKING INSTITUTIONS

BY J. H. DUFRESNE.

A couple of years ago a gentleman from the Boston office was in Houghton county for the first time, and one of the things over which he seemed particularly enthusiastic, and about which he expressed considerable surprise, was the condition and number of our splendid banks. Recently some figures were obtained relative to their resources, which are indeed worthy of notice. Money talks in the Copper Country as in every other community. So do figures. Yet neither money nor figures talk the same way in every section, and there are some parts of the country in which both merely whisper, as if they were ashamed to make themselves heard. In Houghton county, however, no such condition prevails. There both money and figures tell a tale of prosperity, a story of progressiveness and of popular wealth. It is safe to say that one of the most reliable indications of a country's wealth is the size of its bank deposits, since it is in the banks that every dollar is kept, stowed away for a rainy day, whether its owner be rich or poor.

For the purpose of aiding intelligent perusal of the figures which follow, it perhaps will not be amiss to state here the population of the five principal towns of the Copper Country:

Village of Houghton	6,200
City of Hancock	8,600
Village of Laurium	8,400
Villages of Red Jacket and Calumet	22,500
Village of Lake Linden	3,200
Total	48,900

Following is a combined statement of the condition of all the banks in Houghton county. It shows that the total deposits run up to the magnificent total of nearly \$15,000,000.

RESOURCES.

	\$17,371,322.79
Cash on Hand and in Ranks	5,066,190.95
Bank Buildings and Fixtures	293,607.00
Loans, Bonds and Mortgages	\$12,011,524.84

LIABILITIES.

Capital Stock	\$1,155,000.00
Surplus and Undivided Profits	1,075,070.35
Circulation	253,800.00
Deposits	14,887,452.44
	\$17,371,322.79

Remarkable is the result of a comparison with the deposits of all the savings banks in the State of Wisconsin during the year 1905, which were \$921,585. The total amount of money on deposit in all the banks in the State of Minnesota in the same year was \$16,628,787. Of the eleven banks in Houghton county the First National Bank of Calumet has the largest deposits, ranking fourth in the great State of Michigan, and being exceeded only by the Old Detroit National, a consolidated institution with some \$10,000,000, the Commercial National of Detroit, and the Old National of Grand Rapids. The deposits of the Calumet bank, according to a recent statement, were \$3,850,093.53. This bank is closely followed locally by the Houghton National Bank with \$3,178,921.20, and the Merchants & Miners Bank of Calumet with \$2,276,837.18. Very recently two new banks have been organized in the north end of the county, the Mohawk Savings Bank and the First National Bank of Laurium, but their resources are not included in the above table.

PADUCAH'S EIGHTH OF AUGUST

BY J. S. BLEECKER.

Paducah, Kentucky, is probably the only city in the United States which enjoys the distinction of a celebration within its limits of the eighth of August as Emancipation Day by members of the colored race. On that day everywhere from all parts of Kentucky, Tennessee, Indiana, Illinois, Mississippi, Arkansas, Missouri, and sometimes from Louisiana, come thousands of negroes to celebrate emancipation. It is a strange fact that the eighth of August is not the anniversary of any declaration of emancipation in the United States, but is probably the anniversary of a similar declaration in some of the West Indies. It has, however, been selected by the colored people of Paducah as the gala day for their race, and early in the year preparations are made by various committees to entertain visitors. The system of advertising adopted, although apparently not very expensive, as the subscription list runs fairly light, must be, judging from results, very effective, as this year the various railroads and steamboats brought into Paducah on the eighth, over 8,000 colored people. Special trains on the Illinois Central brought in about 6300; the Nashville, Chattanooga & St. Louis, about 1200; and the steamboats over 500; in addition to which numerous excursionists came in on the regular trains, beginning early on the seventh and many of them not leaving until the ninth. When the 6000 resident negroes are added to this it makes about 15,000, a veritable "city of niggers out for fun."

The white people of Paducah recognize this day as belonging to the colored man and his family and practically all business and pleasure is given over to them, very few white people being seen on the streets, and, in fact, very few being able to get out on the streets because of the fact that they must stay at home and do their own work, being bereft of all form of assistance.

The amusements provided for the visitors, while varied, appeal chiefly to the inner man, and everywhere on the street corners in

the city, on vacant lots, and at the various parks and grounds used by the entertainment committees, will be found lunch stands laden with barbecued meat, chicken, watermelons and other Ethiopian delicacies.

The street car company naturally benefits largely by this celebration, as the various amusement places are located principally on its lines, and also as many of the colored visitors come from places where there are no street cars and spend most of their time riding on the various lines as a form of amusement, as well as to keep This year the Traction Company had every car out of the barn (except a few small winter box cars from which the motors had been removed) and these cars, by the judicious assistance of the barn force, the transportation department and the power station force, were kept in continuous operation all day, and well on into the morning of the ninth, before the last departing excursion train carried away the greater part of the temporarily increased population of Paducah. This year the company handled 41,300 passengers, including about 8,000 transfers, with ten single motor cars, fifteen double motor cars and fourteen trail cars, with no material delay from the heavy travel and none at all from defective equipment, track, or lack of power supply.

The eighth of August promises to be celebrated in Paducah from year to year with ever increasing enthusiasm, and the permanency of the anniversary is assured as long as the heretofore extremely good order and excellent conduct of the colored people is maintained. The preservation of order this year was maintained without any additions to the regular police or sheriff's force and reflected credit upon these officials, as well as upon the negroes themselves, the latter realizing the necessity of and insisting upon the best of good behavior in Paducah on August the eighth.

INSULATOR BREAKAGE BY LIGHTNING

BY H. G. PAYNE.

There has been considerable trouble on the Taylors Falls-Minneapolis transmission line due to the breaking down of insulators during lightning storms. This is a three phase 60,000 volt line about 41 miles long supplying power and lights in Minneapolis from the falls recently developed on the St. Croix River. The 4/0 stranded conductors are tied to standard 60,000 volt insulators with a six-foot spacing on the poles. One insulator is at the top of the pole and one at each end of a cross arm about five feet lower. The insulators are made of glazed porcelain with a 14 in. umbrella on top and three petticoats below and are supported on steel pins bolted to the cross arm or pole.

When lightning strikes the line or causes excessive static disturbances on it, one of two things, or possibly both of them, may happen. Either the disturbances may follow the line to an arrester and be carried off, or go to ground over or through the insulator. Experience has shown that if the disturbance is very far from an arrester, say a mile or two, it is very likely to cause a discharge over the insulators. Only a small part of these "spill overs" is accompanied by the breaking of insulators, possibly about one in five.

Two kinds of break-downs are met with. First, the insulator may be simply smashed as a whole, or one or more of the shells may break at the time of the discharge without the line current following. Second, the insulator may be more or less fused by the line current which follows the path of the static discharge. This latter usually occurs where the pin is grounded either by a ground wire or because it is on a steel tower. The illustration shows a large size hole fused straight to the pin. In this particular case there were several smaller holes punctured also, which do not show in the photograph. Holes as large as 1 3-8 inches in diameter have been found in some cases. Several times insulators



have been found after a storm with the top three shells intact and the bottom one cracked clear around and dropped down on the cross arm without breaking otherwise. The umbrella seems to stand the strain better than the two large petticoats.

In order to discover a means of protecting the line against such break-downs, which probably means to keep the lightning off in the first place, several different kinds of overhead ground wires and lightning rods have been put up in sections of a half mile and mile along the middle of the line. In every case tell-tale gaps have been inserted in the ground wires and papers are changed after each storm, thus giving an idea of the amount of disturbance carried off by each kind.

Besides the above, every third pole on most of the line has the steel pins grounded with a wire. Tell-tales are also inserted in these grounds and register the amount of spill-over occurring both in under the protection and in the open. While most of the breakdowns occur on the insulators with grounded pins, this should be expected. On some short sections where the grounds have been removed there is a tendency to break down just as pronounced as where they have been left on, and in addition the pole may be split or splintered by the discharge on its way to ground.

This is a part of the country particularly liable to heavy thunder showers and offers a good opportunity to study the action of protective devices.



News From The Companies

GALVESTON.

The temporary 300 K. W., A. C. 2 phase unit is now in operation and, together with the new 500 H. P. Babcock & Wilcox boiler just put under steam, gives the needed relief to the overloaded condition of the power-station for the last few months. With the completion of the installation of the new 500 K. W., A. C. 2 phase unit and the 300 K. W. motor generator, the foundations for both of which are now completed, the power-plant will be thoroughly well prepared to take care of the increasing load—both A. C. and D. C.—which the growth of its railway, lighting and power business is forcing on it.

Hitherto the condensing water for the plant has been forced up by electric pump through a ten (10) inch pipe from Galveston Bay, some three-quarters of a mile distant from the power station. The growth, inside of the pipe and for nearly its whole length, of large numbers of oysters, conchs and mussels, has reduced the flow area of the pipe to an equivalent of less than four inches in diameter, which gives insufficient water for condensation. As this pipe runs under a paved street and is inaccessible without extreme cost, and as all known methods to clear the pipe without taking it up have proved unsuccessful, it was determined to build an atmospheric cooling tower on the roof of the car barn adjacent to the power station. This cooling tower, designed by Mr. Walter Goodenough, the head of the Southwestern branch office of the Stone & Webster Engineering Corporation at Dallas, Texas, presents some novel features of construction intended to obviate the necessity of fan cooling and at the same time to prevent "spraying"—the latter being a very necessary feature, as the power station and main car barn of the company are situated next to the main public park of the city, within a stone's throw of the county courthouse and right in a nice residence district. The cooling-tower is nearing completion and much interest is being manifested as to its probable satisfactory operation.

On account of its magnificent beach, its pleasure parks and its many salt-water attractions, Galveston is fast becoming a pleasure resort for Texas and the surrounding states, and large excursions come to it almost weekly during the summer season, which—with us—means from April to October. This gives very heavy "rush" traffic on Saturday afternoons, all day Sunday and often all day Monday, of nearly every week. Galveston has a population of about 35,000 persons, about 20 per cent.—some 7,000—of which are negroes, and its electric railway hauls over the city's population nearly every excursion Sunday, and has the record of having hauled 42,000 cash passengers in one day, with an addition of nearly 5,000 transfer passengers. This was done not only without any serious accidents, but without a single break-down or mishap to its cars, every car having made its full mileage for the time it was out on the line.

Commencement of construction of the Galveston-Houston Interurban is being held up pending the arrangements by Galveston county for the building of a causeway across the two miles of shallow bay which separates Galveston Island at this point from the mainland, the Interurban being desirous of using a portion of this causeway instead of building its own bridge across the bay. It is hoped that this matter of building the causeway, which is entirely in the hands of the county, will soon be settled, thus allowing work to be commenced on the Interurban.

As the proposed route of the Interurban allows a tangent stretch of over 40 miles on an almost perfect level, it will be seen that this offers a fine opening for some very high speed work. With this idea in view, Mr. M. M. Phinney, district manager for Texas, accompanied by Mr. H. S. Cooper, local manager at Galveston, recently made a trip of inspection over the high-speed interurbans of Ohio, Indiana and Pennsylvania. Especial attention was given to the (comparatively) new and untried A. C. single phase railway systems in Indiana and Pennsylvania, and much valuable data and experience were gathered which will, later on, be used in the plans for the Interurban.

(H. S. Cooper.)

MINNEAPOLIS, MINN.

The water power plant which has recently been put in operation at Taylors Falls on the St. Croix River enables Minneapolis to boast of having one of the notable recent engineering feats of the country at its service. The erection of this plant which at present has a capacity of 12,500 horse power but which ultimately will have a capacity of 25,000 horse power when completed, places The Minneapolis General Electric Company in a position to serve any customer no matter how large, with a continuous supply of electrical energy. Upon the introduction of this power into Minneapolis a careful canvass was made of the manufacturing districts, the agents being careful to get all the information possible as to the horse power, hours of operation and general character of the work done This information was then worked up by the individual firms. into a classified form and maps were made showing the exact location of the different plants and the company's existing and proposed power lines. Letters were then sent to the different firms on the company's lines, requesting them to allow the company to make tests of their engines and apparatus without cost to them, with the view of being able to serve them with electric power at a cost less than their present equipment. This resulted in securing many long term wholesale power consumers and at the same time unearthed many prospects which are being taken care of as soon as they install their motors and put themselves in readiness for the power.

The plan of procedure that is followed out in making these tests, after permission has been obtained, is to first make a complete sketch of the building, showing location of all machinery, giving number, size, kind of all machines, and what they are used for also showing how they are connected to shafting, etc., showing all line shafting with number of bearings and size of each shafting, in fact giving all details bearing upon the power question.

After this data has been collected the next step is to test all engines by means of the steam indicator. In making this indicator test it is necessary to obtain cards at intervals of about 15 minutes for the full number of hours the plant is operated per day, also obtaining at some convenient time the maximum load of plant with all machines running at full load and then the maximum friction load of plant with all machines running empty, also the friction load of line shafting alone. If possible the larger machines should be tested individually while the balance of plant is shut down. By selecting the important power consuming machines in this manner it will enable one to make a very exhaustive test of machinery in question and show exactly where motors are needed to cut down the friction to a minimum.

In some cases where plants are operated twenty-four hours.

per day it is necessary to make the full run to get at the actual working conditions. This of course necessitates having enough men to handle the test for the full twenty-four hours. It is also essential that at the time of starting test the amount of water in boiler should be noted and condition of fire so that at end of run these can be left as near as possible in the same condition.

During the test all coal consumed must be weighed and all water evaporated taken note of. By this means one is enabled to get at the actual working efficiency of the entire plant and can then show the prospective consumer the advisability of installing electric power and where a saving to him can be produced.

We have found that although tests of this sort require considerable time they fully repay all the time expended as they enable one to become familiar with the proposition at hand under actual working condition and when finally quoting the prospective consumer as to cost of electric power, to state facts, and facts are what count.

(8. H. Conkey.)

- Manager A. W. Leonard is spending about ten days in the Nipigon country in Ontario with his brother Fred Leonard, of Brockton, and with friends from Rockford, Ill., and Houghton, Michigan.
- Mr. F. J. Hovey of the Boston office is in Minneapolis in the interest of The Minneapolis General Electric Company.
- Mr. Paul B. Munson of the purchasing department surprised us all by quietly getting married a few days ago.
- Mr. L. F. Melony, chief clerk of the accounting department, not to be outdone by Mr. Munson, followed his example and was married Saturday morning the 17th of August, and is taking a wedding trip to Isle Royale.
- Mr. L. D. Smith of the superintendent's office and James H. Sargent of the manager's office spent their vacations at their former homes in Massachusetts.

PENSACOLA, FLORIDA.

When the hurricane of 1906 swept over Pensacola, leaving devastation in its wake, the city was engulfed in darkness—the power station was put under water. overhead lines were blown

down, and not a single electric light was visible for a period of three days. But as the sun dissipates the shadows, so the lighting department restored order from chaos and brought the dawn.

The last of November, 1906, a contract department was born to the company—a healthy male child, destined to become the armor bearer of the lighting department. During the early days of this child it was necessary to exercise extreme paternal vigilance, for a disease nourished by the old company was prevalent throughout the city—a malady called the gas-arc-fever—which came with renewed vigor after the storm, and fastened itself upon the community with a tenacious hold, when the electric lights were out and darkness prevailed.

Soon the old saying was enforced, "Train up a child in the way he should go," and the cultivation was begun of such good habits as would create nourishment, stimulation and growth. For nourishment—the daily, weekly and monthly report cards; for stimulation—newspaper "ads." and a show room; for growth—gem lamps, holophane reflectors, Nernst lamps, free sign proposition and block street lighting.

The daily, weekly and monthly report cards show the total number of calls made during a month—calls where no business was obtained—the prospective customers, and also the new customers with their connected load of whatsoever nature.

The newspaper "ads." have been largely educational, all showing some definite point which the company is trying to bring out. The show room is fitted up with a complete equipment of heating and cooking devices—a number of small motors, fans, lamps and reflectors of all descriptions, and sample sign letters. The window display is changed each week, and made to catch the eyes of passers-by.

Gem lamps with holophane reflectors have been used successfully to force out gas installations, and to prove the better illumination which the former give; photographs of the interior of stores so lighted have been taken at night without the aid of flashlights, which convince the most skeptical. In very stubborn cases Nernst lamps have been installed, which, owing to their small watt consumption per candle power, compete favorably with gas in cost.

The free sign proposition is based on a weekly rental of four cents per two candle power, ten-watt lamp, with a twenty-four months' contract. The company purchases and erects the signs, and furnishes all renewals and patrol for same. The sign letter most used is the Federal, sixteen inch, four lamp high, sectional, which can easily be taken apart and re-assembled at the end of the contract, provided the customer does not renew.

Block street lighting has been encouraged, and the side-walks on several streets are now illuminated by arc lamps, the expense of operation being divided among the merchants whose business is benefited by the light.

From the foregoing, it can be seen that the education of our youngest member has been along broad lines; and the results obtained prove that the proper course has been pursued. Even during the summer months the growth has been steady, and the gross earnings of the light and power department for July have been greater than those of December, 1906.

Mr. W. I. Sturtevant, who was formerly connected with the Paducah Traction and Light Company, has been the lighting superintendent, and his efficient management has brought up the quality of the service in a marked degree.

True economy consists in the maximum efficiency, and all the departments of the company adhere to this rule.

The following is a condensed report from December 1, 1906, to July 31, 1907:

Total Calls	Calls, No Business	Prospective Customers	Customers	Total K. W. Connected
Dec 200	137	39	24	17.867
Jan 348	284	32	32	36.354
Feb 205	152	25	28	23.945
Mar 188	143	30	15	36.012
Apr 194	148	28	18	41.833
May 184	134	22	28	34.572
June 295	233	42	20	42.093
July 410	321	101	18	28.341
2054	1552	319	183	261.017

Number of 2 c. p. lamps installed in signs, 1284.

Annual income derived from signs, \$2,670.72.

K. W. connected in heating and cooking devices, 25.3.

Horse power in motors connected, 36 7-40.

Mr. L. A. Thompson, who has been connected with the company in the capacity of assistant superintendent of the light and power department, has resigned to accept a position as electrical engineer with a mining concern in East Florida.

Mr. H. H. Hunt, southern district manager, is expected to arrive here in a few days.

(B. S. Roberts.)

SEATTLE, WASH.

The fine weather reported for the month of July has continued through August and has been productive of good earnings in the railway department. However, the proportion of increase in the gross business during August has fallen off somewhat as compared with that for July, for various reasons, the principal one, we think, being that the real estate business in outlying sections has been very quiet during the month. Where new territory is platted on the outside of the city and offered for sale, we have found a very considerable increase in railway receipts on account of the added travel by prospective purchasers and investigators.

The new Bellevue-Summit Avenue line is practically completed, and we hope to be able to start it in operation by the first of September. The new 19th Avenue line is also near completion, and will probably be in operation within thirty days.

At the new Georgetown power station the construction of the reinforced concrete stack is progressing under contract with the Weber Construction Co. Unfortunately, we have had another burn-out in the armature coils of the 3000 Kw. turbine, and it is not yet ready for continuous operation. We are expecting now that the 8000 Kw. turbine ordered for this plant will be shipped from Schenectady the latter part of the month.

In our commercial department we have been promoting a very thorough canvass among prospective customers for electric laundry irons and other heating specialtics, and have succeeded in interesting a large number of people in their use. While there is a direct profit in the sale of this apparatus, there is a further consideration of increased current consumption.

In our sales department we began the introduction of the use of electrical heating devices about two years ago. We first placed a small order for electric flat-irons, and on their receipt placed them on sale in our show-rooms. Shortly afterwards we began the advertising in the daily and weekly press of the sale of flat-irons, and followed our advertising with circulars mailed to our

current consumers. In the summer of 1906 we got out a free trial contract and selected about three hundred and fifty of our better class of residence consumers, mailing these contracts of thirty days free trial to them. As a result of this campaign, we received quite a large number of signed coupons through the mail, requesting us to deliver an iron on thirty days trial. During the present summer we have continued this campaign of newspaper advertising, and as a result we have been putting out from 250 to 300 flat-irons per month on trial, and have had not more than eight per cent. of the irons so put out returned. To introduce the use of electric heating pads, we presented each of the hospitals in the city with a pad, and also some ten prominent physicians of the city, calling their attention to the advantages of the use of the pad over the ordinary hot-water bag, and requesting that they make use of the pad. We also informed them that we should be pleased to have their opinion as to the merits of the pad when they had had an opportunity to observe its work. In almost every instance we have heard from these people praising the electric pad; and from the number we have sold, we are led to believe that the giving away of these pads has been good policy.

At our show-rooms we have paid particular attention to an effective and attractive display of electrical heating devices of all kinds. We have at various times dressed our show-windows with electrical heating devices in operation, such as the coffee percolator with boiling coffee, teapot steaming, cereal cooker in operation, chafing dish in operation, bucket boiling potatoes, griddle with pancakes on same, broiler broiling steak, and electric luminous radi-These displays have attracted considerable notice, and as a result, we have sold a considerable quantity of all sorts of the devices. From time to time we mail our descriptive literature of electric heating devices, and we find that the sale is continually growing at a very rapid rate. The sale of all these devices has undoubtedly added to an increased output of current from our station at off-peak hours. Since we began, about two years ago, to take up the introduction of these specialties, we have sold approximately the following quantities:

Electric flat-irons, 4,000. Luminous radiators, 40. Water heaters, 130. Heating disks, 110. Chafing dishes, 50. Coffee percolators, 50. Teapots, 25. Grids, 10. Cereal cookers, 20. Ovens, 10. Electric pads, 115. Curling irons, 80. Soldering irons, 90.

In selling these devices, we give an additional discount of ten per cent. below regular price where the purchaser is also one of our current consumers.

Many large new business buildings are now under process of construction, and several more are projected. The New Washington Hotel, a twelve-story steel building will, it is expected, be completed ready for occupancy by the new year. In the same block is being constructed the new Moore Theatre, which is expected to be equal, if not superior, to any on the coast. The Trustee Company is building a new block on Third Avenue for stores and offices, of structural steel construction, occupying an entire half block. Many large apartment houses are being erected in various parts of the city, as the demand for housekeeping apartments in this city is always ahead of the supply. The city has just let the largest contract for re-grading that has ever been made in its history, namely, the taking down of Denny Hill, so-called. This contract will amount to more than one million dollars, and will bring down to a business grade a hill to the north of the developed business district that has stood in the way of business expansion in that direc-This regrading, to a large extent, will be accomplished by the hydraulic process, and a large motor installation will be used for pumping the necessary water from the Sound. Another large re-grade project which has lately been closed is that of re-grading the hill to the south and east, comprising what is called the Jackson street district. This will give a much easier grade for streetcar traffic and for teaming to the Rainier Valley and contiguous territory.

A new amusement park has been opened this month, next south of Madison Park, which latter park is owned and operated by this company, on the shores of Lake Washington. Eastern capital is largely interested in the new park. It is started off with good patronage, and it is expected that very considerable improve-

ments will be made between now and the opening of the 1908 season. The opening of this park will materially increase the railway receipts of the company.

(H. F. Grant.)

SYDNEY, CAPE BRETON.

General business conditions are rather quiet at present, but the outlook for the fall is good. The earnings on the railway and ferry are picking up.

It will, no doubt, be interesting to some of the employees of the Stone & Webster companies to know the regulations regarding electric meters imposed by the Canadian government on electric lighting companies. Briefly they are as follows:

A duplicate of every meter reading must be left with the consumer at the time the meter is read.

All meters must be verified and stamped by the government inspector before installed, and every meter must be plainly marked with the maker's name and number, current, limit of pressure and if for alternating circuits, frequency stamped on it.

Maximum variation on meter allowed 3 per cent. either way. The variation of pressure on A. C. current shall not exceed 4 per cent.

All meters must be verified and stamped again within twelve months of the expiration of five years from previous verification.

Purchaser or contractor may have meter verified at any time at cost of party in fault.

Rehate as to gain or loss may only be taken for three months prior to reinspection.

This company, while complying with the Act, makes a practice of regularly testing all meters on the consumer's premises. Any found incorrect are removed, recalibrated in the test room, and kept aside ready to be stamped by the government inspector. The penalty of violating the above is \$20 for every day such violation exists.

(H. F. W. B.)

The greater part of our work on the construction of the new line has so far been in the solid rock. Some of the poles are down six feet in the solid rock, and it makes a mighty fine looking hole, but requires lots of dynamite; we are also tamping them in well and leaving plenty of earth around the butts to allow for shrinkage.

Our material arrived yesterday (Aug. 17), and we shall be

able to frame the poles and put them up complete. Had we not started when we did, the line would probably have not been finished this year, as we have to take advantage of the weather. As it is, we shall finish none too soon.

The receipts on the cars have been very good lately, and this week ought to be quite a bit ahead of the average.

We hope to be able to give North Sydney a Christmas present in the shape of power from Sydney.

(Walter G. Ross.)

EL PASO, TEXAS.

It is a source of congratulation that the city of El Paso is beginning to develop industries which depend upon the resources of the country around about. A \$500,000 cement plant is now being constructed about a mile north of the smelter, which will manufacture from raw material obtained locally as fine a cement as is produced anywhere in the United States.

Another interesting proposition is a plant for manufacturing denatured alcohol from the cactus which grows so plentifully in this part of the country. This plant is to be operated by power furnished by the El Paso Electric Railway Co.

The price of fuel in El Paso, so far as the Electric Railway Company is concerned, has increased to an alarming extent in the last year. In January, 1906, the cost of fuel oil was 87c. a barrel, but by June, 1907, the price had risen to \$1.63 a barrel, an increase of 87 per cent. in the year and a half. We are now just finishing preparations to burn coal instead of oil, and have installed forced draft apparatus for this purpose. It is hoped to effect a very large saving in operating expenses in this way.

El Paso has recently received four double truck, 29 ft. semi-convertible cars from the St. Louis Car Company. These are equipped with G. E. 81, 30 H. P., 4 motor equipments and Westinghouse straight air brakes. This makes the total number of cars owned by this company, forty. The company has also under order four 15 bench open Narragansett type double truck cars, with the same electrical and air equipment as the four semi-convertible cars above mentioned.

The company has recently agreed with the city of El Paso to join with it in the purchase of a sprinkler car for street sprinkling. The city is to pay for the tank and the street railway company for the trucks, motors and other equipment. The city will furnish the water for sprinkling, and the company will operate the car,

sprinkling all the streets on which it has tracks. The sprinkling car to be used is the so-called turbine sprinkler of 4000 gallon capacity made by the McGuire-Cummings Manufacturing Company of Chicago, Ill.

El Paso was greatly honored on August 15 to 19 by the first convention of the Texas Five Million Club. All the visitors were delighted and astonished at El Paso's growth, and the opinion was freely expressed that El Paso would be the second city in the state to reach 100,000 inhabitants, it being admitted that Dallas would be the first city to reach that figure.

The present city council of El Paso is in favor of the use of tee rail in paved streets, and the street railway company has been authorized by the city to put down a small amount of this rail as an experimental stretch. When the first pavement was installed about a year ago in El Paso, the city council insisted upon the use of grooved rail in the paved section, but the first year's practical operation has convinced everybody that grooved rail is at best very noisy, and that tee rail is preferable.

(C. W. Kellogs.)

TAMPA, FLORIDA.

Several changes in the organization of the Tampa Electric Company took effect August 1. Mr. G. W. Wells, after four years of service as manager, resigned to associate himself with the West Penn Railway Company, with headquarters at Connellsville, Pennsylvania.

Mr. Wells was succeeded by Mr. J. A. Trawick, of Little Rock, Arkansas. Mr. Trawick has been connected with a number of lighting and railway companies in Illinois, New York state, Massachusetts, and more recently, with the Little Rock Railway and Electric Company, of Little Rock, Arkansas.

Mr. G. W. Wilson has accepted the position of lighting superintendent, and will have entire charge of the lighting service from the switchboard to the customer. Mr. Wilson is a very valuable man for this particular work, and was connected with the Little Rock Edison Electric Light and Power Company, and Little Rock Railway and Electric Company for a period of approximately fifteen years. During the latter half of that period he held the position of lighting superintendent and chief electrician. Our company is fortunate in securing Mr. Wilson's services.

Mr. Joseph Fry, formerly soliciting and contract agent for the New Orleans consolidated companies, and for the past three years in charge of this department for the Little Rock Railway and Electric Company, has accepted the position of chief contract agent for this company. Mr. Fry was a very efficient and valuable man for the New Orleans and Little Rock companies, and we are more than fortunate in securing his services. We anticipate an aggressive campaign in the lighting department and will go extensively into the sign, display and illuminating work. Mr. Fry's experience along this line has been extensive, and we expect to see a marked improvement in effective illumination along the business streets within the very near future.

For the past three years Tampa has had a state fair, to which the legislature has appropriated \$15,000 annually toward the payment of premiums. These occasions have been so successful, both from an advertising and financial standpoint, that the legislature again appropriated the sum of \$30,000 for two years to come, which assures Tampa the fair for this year and next.

The fair has previously been held in the month of November, which is an excellent time to secure good exhibits of Florida products, and which furnishes weather as nearly perfect as may be for all outdoor sports. However, the directors of the fair have never been able to secure good rates for those wishing to attend the exposition, and it is several months in advance of the time usually chosen by tourists to visit the state.

For these reasons the month of February, having weather much like November, has been selected as the time to hold the fair this year, as one of the principal reasons of making an exhibit of the products of the state is to attract to this section that class of travel which is made up of homeseekers; and even those tourists who simply are spending the disagreeable winter months away from the north, through seeing this exposition, advertise the different sections of the state after returning to their own communities.

Tampa is very much elated over the removal of the Calixto Lopez cigar factory from Havana here. This is considered one of the finest factories in the Cuban city, and is one of the largest in the world, and it is expected now that others of the independent factories on the island will follow this one to Tampa before many months. The Lopez factory will be located in West Tampa, which is the home of many of the factories outside of the trust, the latter's local factories being in the section of Tampa known as Ybor City.

Tampa is beginning to feel the good effects of the government appropriation for deepening the channel to the mouth of the river, the work on which has been going on for the past two years, and is now not far from completion.

The Seaboard Air Line railroad is spending a large amount of money in terminal facilities on the bayshore, south of the city; among other things erecting a fine drawbridge which reaches from the mainland to Grassy island, the real terminus of the road.

The Tampa Northern railroad, running from Tampa to Brooksville, but rumored shortly to extend beyond that point to reach some of the great trunk lines to the north, is also expending the sum of \$250,000 in terminal facilities to the east of the seaboard on the bay. This road has been just recently built through one of the finest timber sections of the state, and it will also handle great quantities of pebble phosphate from the mines along its route for export through Tampa.

BELLINGHAM, WASH.

In the combination of the three great staples of the Pacific Northwest—cedar shingles, lumber products and canned fish—Bellingham outranks every other city. Located on the eastern shore of Bellingham Bay, an ideal and very attractive site for a large city, Bellingham commands a strategic and economic position 100 miles nearer to Alaska than Seattle, making the city the commercial and seaport center of all that vast and remarkably resource-ful region of northern Washington, already famous for its great forests, its fisheries, its gold fields, its fruit, grain, livestock and farm wealth.

Bellingham Bay is about ten miles long and five miles wide and affords ideal anchorage depth throughout, the average depth being about 40 feet, the minimum in the bay proper being 24 and the maximum 108 feet.

Bellingham is one of the chief Pacific Coast terminals of the Great Northern, Northern Pacific and Canadian Pacific railways, and the headquarters and terminus of the Bellingham Bay & British Columbia railroad, which operates 65 miles of railway all in Whatcom County, reaching the western border of the Mount Baker gold fields and penetrating through the famous Nooksack valley farm and fruit region north as far as Lynden, and east as far as Glacier, seven miles east from which point the right-of-way for an extension of the road has already been cleared. At this latter

point several important gold mines are located, and also the Nooksack Falls power plant of the Whatcom County Railway & Light Company, one of the Stone & Webster companies, controlling the entire street railway, gas and electric lighting and power interests of Bellingham.

- Mr. S. L. Shuffleton, Local Construction Manager for the Engineering Corporation, had his left leg broken in two places between the knee and ankle on Sunday morning, July 21. In starting the engine of his launch, in some manner his foot slipped and his leg came in contact with the wheel. In addition to being broken, his leg was badly crushed, and he has suffered considerable pain in consequence. Mr. Shuffleton will be disabled for several weeks, but, with his usual energy, he is carrying on his work without interruption. He is directing operations from his room at the hospital and has established telephone connection with his office.
- Mr. G. O. Muhlfeld, Construction Manager for the Engineering Corporation, and Mr. Howard F. Grant, District Manager for Puget Sound, visited the Bellingham company on Wednesday, July 24. The day was spent in going over local matters, Mr. Grant returning to Seattle Wednesday evening. Mr. Muhlfeld visited the Nooksack Falls Power Plant, recently completed by the Engineering Corporation for this company, on Thursday, returning to Seattle that evening.

LOWELL.

Mr. J. A. Hunnewell has been promoted to position of General Superintendent.

The new station is rapidly approaching completion and is a model of its kind. The turbine and switchboard are now set up; and it is expected to have steam on by September 15, and new apparatus in every day commission not later than October 1.

The G. E. M. lamps have been a material assistance in obtaining new business, although in many places they have replaced the small arc lamps.

The 71-2 ampere Tungsten series lamps now being installed are a great improvement over the carbon filament lamps.

The Shaw Stocking people have installed three 100 H. P. and two 50 H. P. A. C. motors in their new mill.

The Massachusetts Mohair Plush Company have also ordered several large A. C. motors and are to abandon the old 500 volt D. C. system for A. C. The U. S. Bunting Company is the latest

convert to Central Station drive as it has arranged for 150 H. P. as a starter.

PONCE, PORTO RICO.

The lighting business shows a healthy increase in cut ins, and most of the cut outs are only temporary, due to many families having moved to the country for the summer months.

On July 25 there were races in the Hippodrome between horses from San Juan and from this side of the island, which brought a large crowd from San Juan and intermediate points by special train. Others came on the regular train and by automobile. Our cars were all crowded, in the afternoon, and after the races the facilities of the company were strained to the uttermost to take the racegoers home.

On the night of July 20, Engine No. 2, a tandem compound McIntosh & Seymour, running 200 R. P. M. and rated at 220 H. P., was completely destroyed, due to the backing out of the crank pin key. Fortunately no one was injured, although the runner and oiler, both Porto Ricans, were closing the valves in an endeavor to save the machine.

We are again short of water, as the rain fall in the mountains is not sufficient to supply the irrigating pumps that are above us on the river Portugaise. An interesting feature of this water supply is the fact that less than a mile above our dam the river bed is bone dry, all the water being below ground except in time of a freshet. Two years ago there was nearly always a little water to be seen in this river bed, but so far this year only a freshet causes any to flow on the surface. This feature is common to many of the streams on the south side of Porto Rico.

There is great difficulty here now in obtaining a well educated youth who is willing to do manual labor. This makes it exceptionally hard to fill satisfactorily the position of Stock Keeper. He must be an honest, bright boy and be able to read, write and speak English; but we find that most of the candidates who qualify in the above requirements are unwilling to do the manual labor connected with the position, and dislike to come promptly at seven in the morning and one in the afternoon, and will leave rather than do so.

The tendency, on the part of educated people, to consider manual labor degrading is exerting a very bad influence on all business here, and the best lesson that can be taught here is that labor, well done, is a dignified thing and one to be proud of. Without such a pride in the trades, Porto Rico will never realize its full possibilities in business and manufactures. The island is very fertile and requires only capital and efficient labor to make it remarkably successful in a wide business field.

(H. S. Whiton.)

HOUSTON, TEXAS.

M. Miers, master mechanic, had to leave Houston suddenly for his old home in Kalamazoo, Mich., on account of the serious illness of his father. During Mr. Miers' absence, Albert T. Kunz, store-keeper, is keeping an oversight of the routine office duties in connection with Mr. Miers' position. On August 1, Mr. Kunz was transferred from the store room to the transportation department as student trainman. Mr. R. R. Wells will succeed Mr. Kunz as storekeeper, Mr. Wells having joined the company's forces on July 15.

On July 15 Carl C. Hall, clerk to Superintendent Uriah Foss, resigned to take a position with the First National Bank of Houston. Mr. Hall's departure is regretted by everybody in the organization, including even the "boys" on the road who have been summoned by him many times to a "session on the carpet." Mr. Henry C. Beck, clerk to the manager, will hereafter combine the duties of his present position with the duties of clerk to the superintendent.

On July 24 Mr. E. L. Chandler was temporarily assigned to the duties of instructor of conductors, and Mr. W. B. Cooper was assigned to the duties of temporary dispatcher, to fill Mr. Chandler's place at the booth.

On June 27, Mr. Robert F. Guild, student in the Statistics Department, arrived in Houston, where he reports to Mr. Uriah Foss, superintendent, as student trainman.

On July 6, Mr. J. S. Shawl arrived in Houston to assume the duties of night car barn foreman to succeed Mr. McGlaughlin, who resigned on account of the necessity of leaving Houston to return to his old home in Kalamazoo, Mich.

On July 22, Mr. A. W. Q. Birtwell, formerly assistant treasurer of this company, paid us a visit from Ft. Worth, to audit the books of the local Stone & Webster Engineering Corporation office.

On July 22 Mr. J. Z. Gaston, commissioner of the city of Houston, sailed from New Orleans for New York to investigate the proposition of purchasing paving brick in New York and forwarding the same to Houston by water. Mr. Gaston was met in New York by Mr. T. H. Endicott, purchasing agent of the Stone & Webster Engineering Corporation, where, on behalf of this company, Mr. Endicott assisted Mr. Gaston in his investigations.

The assessed valuation of the Houston Electric Company with Harris county to-day is \$611,900.00, and with the city of Houston \$685,100.00. The rate in the county is 97 cents. On July 2 an ordinance was passed by the city of Houston reducing the tax rate from \$1.90 to \$1.80 per 100.

During the month of July the executors of the estate of T. H. Scanlan, formerly one of the oldest residents of Texas, decided to erect on the corner of Main street and Preston avenue an eleven story building as a monument to this Houston pioneer. The foundation and frame work of this building will be constructed with a view to adding four more stories, making a fifteen story structure. The building will be one of the most complete and upto-date skyscrapers in the South. Construction work on the same will be begun within ninety days.

The great Rice Institute, to be erected in Houston, in accordance with the will of the late W. M. Rice, has been the general topic of conversation among educators of this city for some time. A local newspaper speaks of the Rice Institute as follows:

"The trustees of the Rice Institute have recently been interviewed on two points that mean a great deal for the institution, and also for Houston and all Texas.

One is that the institute should be located at least fifty acres of land, instead of seven acres as originally set aside in the Fourth Ward.

Second, that instead of making it a school of technology, the Rice Institute should be a great university, on the order of Princeton or Yale, and teach every branch of science, literature and arts. It is understood that this is permissible under the Rice will, and that a mere school of technology, which was first contemplated would be too small an undertaking, considering the immense endowment this institution will have.

Conservative estimates place the value of the fund at the disposal of the Rice Institute at between \$8,000,000 and \$10,000,000.

This is the largest endowment of any great university in this country, and is enough to put up magnificent buildings, and at the same time leave \$7,000,000 or \$8,000,000 that are now invested that would earn for the institution at least \$250,000 a year, or enough to give free education to several thousand students.

What such an institution would mean to Houston is hard to

foretell. It would be the greatest institution of learning in the entire country and could be made far ahead of either Princeton or Yale."

The three million dollar terminus to be erected by the Yoakum interests in the third ward of this city on the twelve blocks bounded by Preston and Texas avenues and St. Emanuel and Austin streets is being got under way. The houses from the twelve blocks will be sold by auction to local real estate men, and the work of moving these dwellings to the outer edge of the city will be begun within the next few weeks. A mortgage of five million dollars has been recorded, as detailed in the quotation below from a Houston newspaper:

"The mortgage, which bears date of July 1st, was given by the terminal company on its holdings to the Central Trust Company of New York as trustee to secure the payment of \$5,000,000 in first mortgage 5 per cent. gold bonds, which bear date of July 1, 1907, and become payable July 1, 1937.

For months after the twelve blocks in the third ward were purchased for passenger and freight terminals for the Rock Island-Frisco-Santa Fe roads, the officials did not attempt to move a cog, because it was necessary to have a special law passed at the last session of the legislature to allow terminal companies to issue bonds on physical properties. The law was enacted and is now in effect.

At an early date arrangements will be made to begin construction of the two enormous freight sheds. These sheds will each be 800 feet long, and they will be absolutely fireproof in every respect."

It is expected by the first of the year to see the new terminuswell on its way towards completion.

A rather curious operating problem is presented in the Houston system on account of the large number of railroad crossings. Houston is the meeting place of sixteen roads, and is correspondingly the distributing point for all products coming in from the Gulf of Mexico seaboard and for the outbound products from all the vast territory lying in the great state of Texas, Oklahoma, Indian Territory, the Dakotas, Nebraska and Kansas. As it owes its prosperity to these roads, the city must necessarily encourage more roads to enter the center of the town, and with that idea in view has never imposed onerous conditions upon new roads seeking entrance. No stipulations have ever been made looking toward the abolition of grade crossings. As a result, the Houston Elec-

tric Company has sixty-seven railroad crossings. On one line alone (our Liberty line) we have thirty crossings. Inasmuch as the railroads are confined to the northern and eastern portions of the city, these crossings do not affect, to any degree, the southern and western lines composed of the Aransas Pass, South End, La Branch, Louisiana and San Felipe divisions. On the northern side of the bayou, however, especially in the so-called fifth ward district, which is served by the Montgomery, Highland Park and Liberty lines, we are confronted with the problem of serving a large district occupied by large railroad shops, rice mills, compresses, grain elevators and a tremendous number of residences of railroad and factory employees.

This transportation problem in the fifth ward is probably as difficult a one as will be met in any city in the United States. As stated above, this section of the city is in the center of the big railroad shops and is the entrance to the town for all the railroads. Over the crossings enumerated above pass practically all the freight entering and leaving this great freight center of the south-Trains one-quarter and one-half mile long are hauled over our crossings at a slow rate of speed, and in many cases stopped upon the crossings through negligence, defects in equipment or irregularity of schedule. With this large number of crossings, many times during the day our service is interrupted for periods varying from five to thirty-five minutes. Against such interruptions we and the irate citizens of the fifth ward have protested time and time again to the railroad officials and to the city government, and for a time have always obtained some small relief. The difficulty, however, is in the situation itself. The city has not yet reached the size that it can afford to demand that the railroads abolish the grade crossings. The flagging of such a large number of crossings requires considerable time. The result is that on account of the interruptions to the service due to flagging, trains holding us at crossings, defects in derailing devices, and all other attendant evils, cars that make nine miles in other portions of the city, average only five miles in the fifth ward, and the service, as a whole, is poor.

In addition to the above trouble, the northeastern quarter of the town is connected with the business center by an old fashioned bridge, which is of such type that it is impossible to run large double truck cars safely over the same. We are therefore compelled to serve this part of the town with single truck cars, which although of comfortable type, do not compare favorably with the magnificent, double truck cars we are purchasing for other sections of the city. Therefore, we have the beautiful problem of pacifying committees from the fifth ward "Improvement Club," who are "kicking" against the unpopular type of equipment, slow speed, irregular and infrequent schedules, and the general cussedness of the street car system. Visits from such committees when the thermometer stands 102 degrees in the shade are excellent antidotes for possible megacephallic tendencies in the organization due to complimentary remarks in the Mayor's annual message.

The assessed valuation of Harris county for the year of 1907 will be in excess of \$58,000,000, or practically an increase of \$9,000,000 as compared with last year. The assessed valuation of the city of Houston will be \$47,212,997, or practically an increase of \$9,086,867 as compared with last year.

On July 26 Mayor H. Baldwin Rice, of the city of Houston, had as his guest on the trip down the Bayou from Harrisburg to Galveston, General Henry M. Roberts, formerly member of the board of government engineers, connected with the improvement of Buffalo Bayou, and among the other guests were the president of the cotton exchange, the congressman of this district, representatives of all the large banks, the railroads, and the manager of the Houston Electric Company. General Roberts was very favorably impressed with the work which has been done within the last eight years, during which time the channel across Galveston Bay has been excavated, and the work prosecuted up to the very doors of Houston, until the task of constructing the harbor has been about one-third completed. A number of cuts have been made and the Bayou straightened. The tonnage capacity of a large number of small boats has been very materially increased. The committee of business men who were guests of Mayor Rice for the day were exceedingly enthusiastic over the present prospects of the deep water proposition, and predicted a tremendous growth in the tonnage on the Bayou during the next year, especially if the line of the Houston Electric Company is extended to Harrisburg, in accordance with the local newspaper predictions of the last six months.

The family of John F. Usener, chief engineer, is spending the summer at La Porte on Galveston Bay. Mr. Usener and his son, Fred Usener, electrician at the car barn, joined the family at La Porte on the 20th of the month for their two weeks' vacation. During Mr. Usener's absence Mr. Mack Ellis has had charge of the power plant, and has been endeavoring to make a record on low fuel oil consumption.

HOUGHTON COUNTY, MICH.

Electric Park continues to be as popular as ever. During July there were 12,415 visitors, and this record is expected to be surpassed in August. Almost every day for the remainder of the season is booked either for a picnic or a dancing party or a concert. An innovation at the Park is a Calumet & Hecla band promenade every other Friday evening. These "promenades" are select dances given by the C. & H. band at which an excellent program is rendered by the full band. The promenades held in Calumet are very popular, and those at the Park bid fair to become equally attractive.

The new railway waiting rooms at the Arcadian and Osceola stations have been completed. They are very substantial little buildings and add materially to the appearance of the interurban section of the road. The attendants live on the premises and keep a confectionery and cigar store in connection with the waiting room, as well as acting as express agents. Similar stations at Limerick and Franklin have been in use for a number of months.

The meter department has received a new card catalogue for keeping a record of its meters, and the new system, which should be a great benefit to the department, is being put into operation.

Th bi-weekly meetings of the heads of departments of the companies, which have but recently been inaugurated, are highly successful. Our companies are scattered over a wide territory, and by bringing the departments into close touch with one another every two weeks very beneficial results are derived. At these meetings are discussed various matters of immediate interest to the companies, including the several subjects decided upon at the previous meeting. For example, at the next railway meeting the following topics will be up for discussion:

Is our express service efficient and does it pay? Records of material in stock.

How can we get desirable trainmen?

Condition of inside of cars is bad.

Unit cost of maintenance.

At the next light meeting the subjects are:

The Engineering Department.

Are meters tested often enough?

An exhibit room is necessary to this company

Advisability of checking lighting bills.

Building up our day load.

It is very seldom that more than two or three of the subjects are covered at one meeting, for which the morning only is allowed. Mr. McGrath has been elected chairman of these meetings and Mr. DuFresne, secretary. Records of the discussions are kept, and these are expected to make very interesting reading, for although the personal element is entirely eliminated at these conferences, yet sometimes the debates become quite animated.

Mr. R. P. Gifford left here on the fourteenth of August for a visit at his home in Lynn, Massachusetts.

Mr. and Mrs. Woodsome and Mr. and Mrs. Nelson spent a very enjoyable week camping on the shore of Lake Superior early in August.

Harry Isler is at present on a fishing trip to the North Shore of Lake Superior with Mr. Leonard, manager of the Minneapolis Company.

The total output of copper from this district for the first seven months of this year was 141,635,800 pounds. This was an increase of 7.5 per cent. over the same period of 1906.

Illuminating the streets by means of "stringers" is becoming very popular in the Copper Country. A subscription list is going the rounds of the Oak street merchants of Red Jacket for the purpose of raising funds for having stringers placed on Oak street, to be lighted every week day evening.

The contract department reports the sale of 425 electric flat irons this season.

For the first two weeks in August we had with us Miss Lyons of the General Electric Co., to demonstrate the utility of electricity for cooking and heating. Practical demonstrations were given in the use of the oven, chafing dish, frying pan, coffee percolator, etc. This class of demonstration we consider to be of great vlaue, for the reason that the majority of people do not seem to appreciate, until shown by actual usage, that electricity really can supplant gas or coal for cooking. While the attendance was not up to our expectations, the effect on the people reached was undoubtedly

good. We have already made some few sales of the utensils which we can trace directly to the demonstrations, and we expect with these as an entering wedge, ultimately to materially better our load factor.

FORT HILL CHEMICAL COMPANY: " .

Superintendent Burroughs made an automobile tour of eastern Maine in August. He reports low water and high dust.

Unless there are heavy rains very soon the industries at Rumford Falls, including the Chemical Company, will suffer from lack of water power.

Asst. Supt. Hyde is at his home in Waltham for a few weeks.

EIBEL PROCESS COMPANY:

John Bailey has changed his place of residence from Rhinelander to Wausau, Wisconsin.

A. I. Mitchell spent a part of his vacation in the Maine woods.

STONE & WEBSTER CHEMICAL DEPARTMENT:

Dr. Mighill enjoyed his vacation with his Stanley run-about, which he has just overhauled and put in fine condition. Mechanician Mitchell was able to render him valuable assistance during the overhauling process.

James MacKaye, author of "The Economy of Happiness" has been at Jackson, N. H., on vacation. Such time as is not devoted to the Chemical Department Mr. MacKaye usually employs industriously on his literary side line.

Francis Brown took his vacation in September.

The Chemical Department moved to its new quarters in the Stone & Webster Building the first week in September.

QUOTATIONS

ON

SECURITIES OF PUBLIC SERVICE CORPORATIONS

UNDER THE MANAGEMENT OF

STONE & WEBSTER

SEPTEMBER 1, 1907

NOTE:—Quotations are approximate. Unless indicated to the contrary Bonds and Notes are 5 per cent and preferred stocks 6 per cent non-camulative. Bonds are sold plus accrued interest.

COMPANY	BONDS	PREF.	OOM.
Blue Hill Street Railway Co., The	100	No pref.	•••
Brockton & Plymouth St. Ry. Co.	100	No pref.	••••
Cape Breton Electric Co., Ltd.	90	82	20
Columbus Electric Co.	94	••••	••••
Columbus Power Co., The	96 9 5	3	16
Dallas Electric Corporation	95	60	20
Edison Elec. Ill. Co. of Brockton	100 100	No pref.	115
El Paso Electric Co.	923/2	90	471/2
Fall River Gas Works Co.	No bonds	No pref.	280
Galveston Electric Co.	95	88	85
Galveston-Houston Elec. Co,		88	3 5
Houghton County Elec. Lt. Co.	95	221/2 8	15
Houghton County St. Ry. Co., The	90	95	25
Houston Electric Co.	95	88	35
Jacksonville Electric Co.	95	95	90
Key West Electric Co., The	••••	9	••••

COMPANY	BONDS	PREF.	OOM.
Lowell Elec. Lt. Corporation, The	100	No pref.	195
Minneapolis General Elec. Co., The	104	105	100
Northern Texas Electric Co.	941/28	80	371/2 11
Paducah Traction & Lt. Co.	90	4. 5. 6. 60	18
Pensacola Electric Co.	98	873/2	26
Ponce Electric Co.	100 7	No pref.	••••
Puget Sound Electric Railway	98 9434	88	55
Puget Sound Power Co.	102	No pref.	15
Savannah Electric Co.	95	80	121/2
Seattle Electric Co., The Notes	101½ 100	97	821/2
Tacoma Railway & Power Co.	100	No pref.	17
Tampa Electric Co.	No bonds	No pref.	125
Whatcom County Ry. & Lt. Co.	95	88	49

1.—Cumulative. 2.—No dividend yet paid. 3.—Bonds of Northern Texas Traction Co. 4.—5 per cent. 5.—Cumulative after Dec. 1, '07. 6.—1 per cent paid Dec. 1, '06 and June 1, '07. 7.—6 per cent. 8.—Par \$20. 9.—Listed Boston and Louisville. 10.—Listed Boston. 11.—Listed Louisville. 12.—Listed Columbus, Ohio. 13.—Listed Boston, Columbus Ohio, Louisville. 14.—Listed Louisville, Columbus Ohio, '15.—Held by Seattle-Electric Co. 16.—Held largely by Columbus Elec. Co. 17.—Held by Puget Sound Elec. Ry. 18.—4% per cent.

STONE & WEBSTER

Securities Department

OFFICES:

Boston - - - 84 State Street Chicago, 604 First National Bank Bldg

NOTE. — The Securities Department handles securities for those wishing to purchase or sell, keeps accurate quotations, and gives out information about above companies.

Miscellaneous Notes

COUPONS AND DIVIDENDS DUE

Per C	ent
Oct. 1, Blue Hill Street Railway Company, The, 5s, due 1923	21/2
Oct. 1, Columbus Electric Company, 5s, due 1933	21/2
Oct. 1, Columbus Power Company, The, 5s, due 1936	21/2
Oct. 1, Columbus Railroad Company, 5s, due 1937	21/2
Oct. 1, Dallas Electric Corporation, 5s, due 1922	21/2
Oct. 1, Houghton County Street Railway Company, The, Pre-	
ferred Stock, 6 per cent	3
Oct. 1, Savannah Electric Company, Preferred Stock, 6 per	
cent	3
Oct. 1, Seattle Electric Company, The, Preferred Stock, 6 per	
cent	3
Oct. 1, Tacoma Railway & Power Company, 5s, due 1929	

LIBRARY OF STONE & WEBSTER

Current Literature

Selections from the August Magazines and Book Accessions.

Below are given the larger proportion of the most important references for the month of August. Although in somewhat classified order it must not be understood that the entries are sufficient in number to make this a reliable list of references to all the articles of substantial interest to us in the periodical literature coming to this office. A card index collection of the items is kept in the library, and special lists on given topics can readily be struck off from the thousands of slips thus accumulating.

Ed, (r), *, and + are used to indicate editorial, review, illustration,

and map, table or diagram, respectively.

Bridges

The tidewater & the deepwater rys. II Viaduct & bridges. *203-6.2p-RRGaz-8|23|07

Concrete

- Proposed British standard rules for the design of reinforced concrete bldgs. +90-4.3p-Egrg Contracting-8|7|07
- Rept of cost of concrete work in Gunnison tunnel. HAHowe. •110-6p-Cement Age-8|07

Generators, Stations, etc

- 4 Kern River No 1 power plt of the Edison E. Co. Los Angeles.
 *+277-4.6p, *317-6p, *+359-4.5p-El Wld-8|10,17,24|07
 5 Pr plt inside of a dam on the Patapsco river. Ed-196-0.8c
- Ed-196-0.8c. *+207-3.2p-El Wld-8|3|07
- The cost of el supply: application of the principles upon which the present maximum demand method of central station rates are based to central stations having large storage battery auxiliary. JHopkinson. 219-2.5p-El Wld-8|3|07

Lighting

- 7 Experiments on Osram, Wolfram, Zircon & other lps (concld); effect of voltage variation, specific heats, etc. JTMorris,FStrode &RMEllis. *+584-3.5p, +624-2.7p-Electrician-7|26,8|2|07
- To what extent in practice can the distrbn of it about a lamp be modified by reflectors or globes? abs NYS & dis. +205-16.5p-Illum'tg Engr-4|07

Steam Engineering

Boiler, engine & generator testing & management II: Notes on engine testing. CLHubbard. *+163-4.3p-El Rev-8|3|07

10 Efficiency in the burning of fuel under the steam boiler: III Practical modifications affecting the theory of air supply. WDEnnis. *+742-10p-Engrg Mag-8|07

The operation & care of injectors; a practical dis of the leading types, explaining their action & the most approved methods of connecting. WHWakeman. +520-3.2p-Power-8|07
 Gas producers for pulverized fuel, utilizing all grades of coal.

788-5.3p-Engrg Mag-8|07

Refrigeration

13 Refrigeration as an auxiliary to the pr plt. JHHart. Ed 372-0.5p, *291-4p-Cassiers Mag-8|07

Railway Affairs (See also 32-37)

- 14 Electrification of the N Y, N H & Hartford. EHMcHenry. *+242-13 3p-St Ry Journal-8|17|07
- Some facts & problems bearing on el trunk line operation. 15 FJSprague, AIE. *+1127-90.5p-Proc Am Inst El Egrs-7|07 Notes on steel rails: chemical composition, cross section, mf &
- mechanical testing, etc. WRBowker. 493-10p-St Ry Bull-8 07 The choice of frequency for single-phase a c ry motors. Abs
- AHArmstrong, AIE. +1047-10p-Proc Am Inst El Egrs-7/07 Catenary line construction on the N Y, N H & Hartford R R. 5p-El Wld-8|17|07
- 19 The use of inter-poles on ry motors. Abs CRenshaw SRA of NY. +434-5.8p-El Jrnl-8|07
- 20 Handbook of el'l equipment of cars, prepared for instruction of employees on N Y City Ry. 706-2.7p-El Tractn Wkly-7|25|07
 21 Instruction of car & train service men, Boston Elevated Ry Co. *793-4.6p-El Tractn Wkly-8|22|07
- Pittsburg & Butler St Ry Co. I, Power house, high tension lines, 22 etc. II Substations, transmission lines, roadbed, rolling stock, NNBlakemore. *+208-6.6p, *+256-8p, St Ry Jrnl-8|10,17|07
- 23 The operating costs & revenue of urban rys: analysis of the Interborough system of N Y City. GWWerner. +728-7.5p-Egrg Mag-8|07, Abs 223-0.6p-El'l Rev-8|10|07
- Rr legislation of the yr 1907: summary of important statutes. 168-2p-RR Gaz-8|16|07

Standards and Methods

- 25 Standardization rules of Am Inst El Egrs: gen plan with definitions; data, performance, specifications, tests, etc. +1077-29.6p-Proc Am Inst El Egrs-7|07
- Mtg of the standardization committee, Am St & Interurban Ry Egrg Assn. Standard axles, journals, brake shoes, wheels. Ed 9-0.6c-97-0.7p, Ed 153-0.7p, +157-6.6p-Elec Ry Rev-7|27, 8|10|07 26
- A simple system of keeping & recording egrg costs. MFisher. 27 +101-2p-Egrg Contrctng-8|14|07

Book Accessions

- 28 Stocks & stockholders: forms of stock, transfers, meetings, dividends, powers of corporate officers, rights & liabilities of stockholders. ALHelliwell. 1071p,6x9,1903. *025,H37.1903
- Brush & tank pole treatments. CGCrawford. U S Dept Agric, Forest Service Cir No 104. Illus, Tables. 6x9, pp 24 (gift).
- 30 Practical problems in banking & currency: being a number of selected addresses delivered in recent yrs by prominent bankers, financiers & economists. Ed by WHHull. 1907. 6x9, pp 596.
- 31 The nature of capital & income. IrvingFisher. 1906. Diag. Tables. 6x9, pp 427. \$3.

- Amn rys as investments: detailed & comparative analysis of all
- leading rys & methods of estimating ry values. CSnyder. 1907. 6x9, pp 762. *022.S9. \$3.20.

 33 Finances of gas & el lt & pr enterprises. 4th ed. WDMarks. Diag, 5x7-540p-*021.M34-1907(Statistics of earnings & expenses, constructing specifications, discussions of costs & prices, operating rules & details. "The object of this collection of papers is to afford those desiring to know the proper prices to be charged for electric railway fares & freight, gas, and electricity a rational & practical method of determining them"—Preface)
- 34 Fourth an con Am St & Interurban Ry Engineering Assn, Columbus, Ohio 1906: Control apparatus: Ties, poles & posts; Standardization; Gas engines, etc. 255p-6x9 *6900.As3.058-1906
- Twenty-fifth an con Am St & Interurban Ry Assn, Columbus, Ohio 1906. 6x9, 00 472. *6900.As3.058-1906. Repts & papers on insurance, freight, municipal ownership, employees, interurban traffic, etc.
- Third an con Am St & Interurban Ry Claim Agent's Assn. Columbus, Ohio 1906. 6x9, pp 253. *6900.As3.058-1906
- Tenth an con Am St & Interurban Ry Accountants' Assn. Columbus, Ohio 1906. 6x9, pp291. Accounting of capital expenditures: use of curves in statistics: depreciation as applicable to el rys: rept on a standard system of el ry accounting, etc. 291p 6x9 *6900.As3.058-1906

STONE & WEBSTER

84 STATE STREET, BOSTON

General Managers of

The Lowell Electric Light Corporation The Seattle Electric Company Puget Sound Electric Railway Columbus Electric Company Cape Breton Electric Company, Ltd. El Paso Electric Company Jacksonville Electric Company Ponce Electric Company Northern Texas Electric Company The Minneapolis General Electric Company Edison Electric Illuminating Co., of Brockton Houghton County Electric Light Company Brockton and Plymouth Street Railway Company The Houghton County Street Railway Company Whatcom County Railway and Light Company Savannah Electric Company Dallas Electric Corporation Paducah Traction and Light Company The Blue Hill Street Railway Company Fort Hill Chemical Company Tampa Electric Company Pensacola Electric Company The Key West Electric Company General Electro-Chemical Company Houston Electric Company Galveston Electric Company Fall River Gas Works Company

STONE & WEBSTER PUBLIC SERVICE JOURNAL

NOVEMBER, 1907

EDITORIAL COMMENT

Much has been written, and vastly more remains to be written, concerning the relation of municipal ownership to the money market. The present financial situation suggests one contingency in particular. Municipalities have recently been finding it very difficult to borrow the money necessary for their public improvements. The great city of New York, for example, has been obliged to raise the rate which it will pay on its bonds to 41-2 per cent. Suppose it is not so easy in the next few years to obtain funds as it has been in the last few years. Take the case of a city that has gone in for municipal ownership. If the city cannot borrow so freely as in the past, it is quite likely to reach the point where it will have to curtail the activities of its municipal plant That means it may have to do two things—cut down the facilities it affords and reduce its operating force. That is, it may on the one hand have to offend a city full of consumers, and on the other the labor element. What will be the effect on the politics of that city?

Modus vivendi is a term in frequent use these days. Last year a modus vivendi was reached by the powers of Europe over Morocco; still later, a modus vivendi was agreed upon touching

Fully as necessary is a modus the Newfoundland fisheries. vivendi between the public of the United States and its public service corporations. The aim of all industry is to reduce friction and prevent economic waste. Yet how great is the waste oceasioned by the constant warring between the public and the public service corporations. Because of this friction the great law of specialization—the law which declares that the power which can perform a task with the highest efficiency and at the lowest cost should be allowed free expression—is rendered inoperative to a very large degree. It is quite generally forgotten that the penalty for economic waste invariably falls on the public-the consumer pays the tax. That is a law of nature which can never be overcome by human legislation. A proper co-ordination of the industrial activities of mankind would effect an incalculable economic saving, and this saving would accrue almost wholly to what is called "the public." That a perfect co-ordination will ever be reached is doubtful,—to err is human. A sincere desire for such co-ordination, and a determined effort to achieve it, would, however, secure immesurably great benefits for the public, to say nothing at all of the public service corporations. If the modus vivendi be of importance in the realm of politics, it is incontestably of greater importance in the realm of industry.

"The Inter-Urban Era"

The Wall Street Journal has hit upon a happy phrase. It speaks of "the interurban era," and what it means is this:

"The spread of the interurban traction lines in the East and in the Central West is not simply an event; it is an era. An era is a period in which a distinctive development has occurred which marks it off from what has gone before and what is to follow. This is just what the interurban lines have done in the relations between the city and the country in the territory which they traverse.

This new relation between city and country has economic and social consequences of the most fundamental character wrapped up in it. Fortunately, it is not the big, self-centered city which is concerned in it so much as the moderate sized municipality which has not forgotten the rock of rural life from which it was hewn, and is still a good deal of a country town. Take Indianapolis as a typical city of the character. It stands as a center in a web of traction lines radiating in all directions. It is estimated that six million passengers are handled each year by the roads running into the central

station. These lines reach out to a score or more of cities which are in themselves minor centers of traffic and travel, but all of which converge upon the main point of interurban lines, making a nexus of roads by which the people of the whole territory are brought into touch with one of the main primary markets. Add to this the telephone communications and you have an idea of how easy it is for them to communicate with one another in order to act in common or to learn from central sources how the market is going and what the opportunities for trading are.

As yet these lines do mainly a passenger and express business, but the freight service will come sooner or later, because the lines have a greater degree of adaptibility than the steam lines. They are creators of traffic in fields where railroads either could not or would not enter.'

"The interurban era" is a rich theme for discussion. It has its historic aspect, and its prophetic; its economic aspect, and its social. Time would fail to dicuss any one of these adequately. The "era" began not much more than twenty years ago; and yet what a revolution it has wrought! It has transformed the countryside and contributed marvellously to the development of city life. Take any community and compare its conditions with those of two decades ago. Such a survey brings out one very striking fact,—stagnation has given place to movement. remarkable, for example, is the change that has been wrought in the rural life of Massachusetts. The highways of the Bay State are now a network of steel rails; the isolation of the country towns has in very great measure been destroyed; the rural districts have had the breath of a new industrial and social life breathed into them; they have been forced to feel themselves a part of the great bustling world of human affairs.

Or take any one of our great cities. How meagre seems the life of Boston twenty years ago in comparison with that of today. Those who have witnessed the transformation are keenly alive to the fact that a new Boston has been created,—Greater Boston has come into existence.

The community has profited as it has seldom profited in the past from an industrial movement; for the first and great essential of human progress is transportation facilities,—it is in proportion as these have been developed that nations have risen to greatness. But while the community has waxed stronger in a way to excite astonishment, it has been prone to forget the real agents to whom its increase in vitality has been due. It has been quick to avail itself of the new transportation facilities, but it has been slow to

recognize the intelligence and courage that have provided the facilities. And yet nowhere has there been a more imperative demand for intelligence and courage than in the creation of "the interurban era." Many and costly have been the mistakes of the pioneers of the "era." They have used their best intelligence and they have risked their money. Splendid has been the result to the community; but the men who have accomplished the result can testify that there is no royal road to success.

But what of the prophetic side? Of this it is not easy to The sky is not without clouds. The intelligence and courage that have ushered in "the interurban era" have, despite their great accomplishment, done hardly more than the initial They have provided a foundation for a structure of incalculable proportions, and they are prepared to carry the work to completion. If they fail to do so, it will be because they are sore let and hindered. Brains and capital are the most sensitive things in the world: it is instinctive with them to insist on doing their work in their own way. The question is, How far shall the community in the future restrict the initiative of brains and capital in developing "the interurban era?" If the restraints which the community places upon those who would devote their thought and money to the interurban transportation problem are rational, the work so far done by such persons will seem slight beside that which will eventually be accomplished.

Today, we are in the midst of a period of storm and stress in economic thinking; but this, we are convinced, will at no distant day give place to an era of tranquillity and clear thought.

BOSTON ELEVATED RAILWAY COMPANY

By F. N. BUSHNELL.

In December, 1906, the Stone & Webster Engineering Corporation was requested by the Boston Elevated Railway Co. to make an examination of its power supply and to recommend a system of generation and distribution of power which would best provide for its present and future requirements. Reliability, economy, and the fullest utilization of its present plant were items to be considered.

This report was made and a comprehensive scheme of power development was recommended. Investigation showed that the requirements of the system at that time exceeded the capacity of the existing power stations by 7500 Kw. and that this shortage would, by the time additional apparatus could be installed, amount to 12,250 Kw., so that, pending decision on the recommendation for a permanent development of the system, it was absolutely necessary to install 12,000 Kw. of capacity at once to meet existing requirements. Recommendations as to this emergency installation were made, and after full discussion it was decided by the Elevated Co. to add 10,800 Kw. in generating capacity to three of their existing stations:

5400 Kw. in Lincoln. 2700 Kw. in Charlestown. 2700 Kw. in Harvard.

It was decided to put in direct current engine-driven generators, conforming in general design to the existing machines in the various stations, and to provide room for one additional unit in the Charlestown and Harvard stations.

The Stone & Webster Engineering Corporation were retained as engineers to design and construct these three extensions, and were requested to push the work forward as rapidly as possible so as to put the new machinery in service before January 1, 1908. The work has now progressed to a point where there seems to be no doubt of its completion within the time named, and it is thought a description of the work and some of the methods employed may be of interest. The Lincoln Power Station is described in detail in this paper and descriptions of the other two stations will follow.

The Lincoln Power Station is the most centrally located of the three plants now being extended. It furnishes current for surface and subway cars operating in the center of the city, as well as a large proportion of the power for the elevated system. The old station contained three 2700 Kw. direct current units driven by vertical cross-compound condensing engines of the Corliss type, two of which were built by the Rice & Sargent Engine Co. and one by the Westinghouse Machine Co. Steam was furnished by 6000 H. P. of Babcock & Wilcox boilers, the gases being carried away by a single chimney 13 ft. in diameter by 250 ft. high.

The addition to the building covers 11,881 square feet and extends from the end of the old building to Commercial St. The foundations consist of a heavy concrete base supported on piles. The superstructure is of steel and brick construction and is very heavy, particularly the boiler room, where the steel is designed to carry the boilers, economizers and an overhead coal bunker having a capacity of 33 tons per linear foot, or a total of about 3000 tons. The foundations and superstructure for the building were designed by the Stone & Webster Engineering Corporation and the architectural features were worked out by the architectural department of the Boston Elevated Railway Co. The lines of the old building were carried out as far as possible, as can be seen by the accompanying photograph, the floors being at the same grade and the general arrangement of boilers, engines, and generators practically the same. The cuts opposite this page show the floor plan and cross section in detail.

A second stack has been built of the same size as the old one, the foundation for this having been built at the time the original building was put up.

Eight 600 H. P. Babcock & Wilcox boilers have been installed. Each boiler has three 42 in. x 21 ft. steam water drums and 294 4 in. x 18 ft. tubes made up in 21 sections of 14 tubes each. The boiler suspensions are attached directly to the building columns. Each boiler is equipped with a superheater of sufficient area to heat the steam to about 50 degrees above the temperature normal to the existing pressure when the boilers are running at their

rated capacity and are so proportioned and arranged in the boiler that the temperature of the steam will not exceed 75 degrees above normal when the boilers are running at 50 per cent. above their rated capacity. The furnaces are equipped with Roney mechanical stokers 150 in. wide and 26 grates deep, providing an effective grate area of 111 sq. ft. exclusive of the dead plates and one-half the dumping grates. These stokers are fitted with the new "Sectional Fin Type Grate," which it is expected will be much less expensive to maintain than the type of grate heretofore furnished with this type of stoker.

The boiler feed water will be supplied by four 14 in. x 9 in. x 18 in. "Warren" outside center packed pumps located in the basement directly under the boilers. Any three of these pumps are of sufficient capacity to supply the entire station when running at 50 per cent. overload, thus permitting of shutting down one pump at any time for inspection or repairs.

Two fuel economizers made by the B. F. Sturtevant Company of Boston will be installed, each containing 576 pipes made up in 48 sections of 12 pipes each. These machines are of the Sturtevant heavy pattern type with metal to metal joints throughout. They are required to be tested and made tight under 400 lbs. cold water pressure.

The feed water will be heated by passing it first through primary heaters in the exhaust pipes between the low pressure cylinders and the condensers, then through an open heater, where it is brought into direct contact with the exhaust steam from the various auxiliaries, and finally through the economizers already described. These primary heaters of 1055 feet of heating surface each, were made by the National Pipe Bending Company of New Haven. Each is guaranteed to heat 130,000 lbs. of feed water per hour from 40 degrees F. to within 5 degrees F. of the temperature of the exhaust steam. They are of the horizontal closed type with external headers for water connections, so arranged that each individual tube can be easily inspected by simply removing the cover plates of the heads. The ends of the tubes are expanded into the headers, and in the event of a leak in any tube it can be plugged and the heaters operated with the remaining tubes.

The open heater is of the Cochrane horizontal cylindrical type, with cast iron trays which perform the double function of collecting the impurities in the water and of separating the water into small particles so that it will more readily absorb the heat from the exhaust steam. This heater should heat the feed water to a temperature 3 degrees lower than the exhaust from the auxiliaries, and it is expected that the water, after passing through the economizers, will have a temperature of about 250 degrees F.

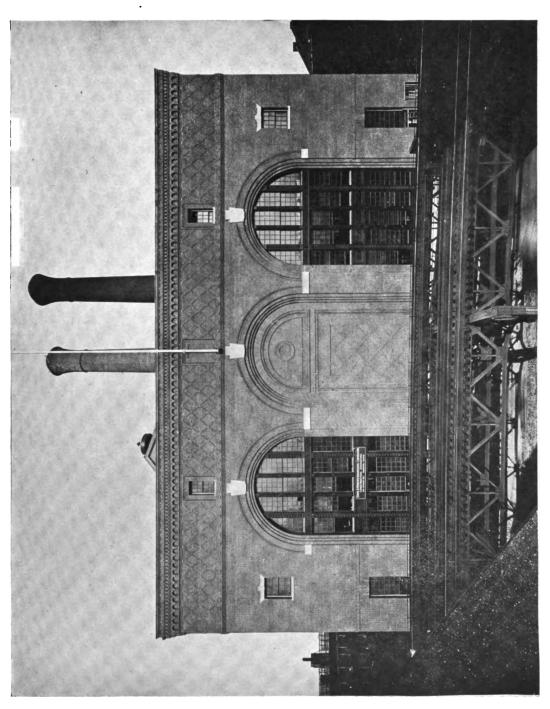
The engines, built by The William Tod Company, are vertical and of a very heavy type, being of the pattern furnished for rolling mill work. They have cylinders 42 in. and 90 in. in diameter by 60 in. stroke, and will run at 75 revolutions per minute. When running with 180 lbs. initial steam pressure, they will have a sustained overload capacity of 50 per cent. with a drop in speed from normal not exceeding 2 per cent. The shafts are of fluid compressed steel, 32 in. diameter in the bearings and 37 in. in the center and are hollow forged, there being a 9 in. hole throughout the entire length of each shaft.

Each engine weighs 1,100,000 pounds, including the fly wheel. This wheel is of cast iron, 25 ft. in diameter and weighs 270,000 lbs. It is designed with a large factor of safety. Each wheel is to have a circular rack fastened to the inside of the rim for engagement of the pinion of the barring device. This barring device, driven by 30 H. P. electric motor, is intended to facilitate handling the engine when setting valves or making repairs, and is arranged to take up a minimum of space, and at the same time to be readily accessible and convenient for the operator.

Jet condensers built by Warren Steam Pump Company of Warren. Mass., are used in connection with vertical direct acting twin air pumps. The steam cylinders are 16 in. diameter and the air cylinders 48 in. with a common stroke of 24 in., the water cylinders being constructed wholly of bronze to resist the action of the salt water. These condensers are the largest of this type which this company has made.

Two 2700 Kw. direct current generators are being installed. They are built by the Allis-Chalmers Company and are direct connected to the engines described above. They are compound wound and are so designed that by a variation in the adjustment of the shunt on the series field winding they will operate at any characteristic between one rising approximately 10 per cent. and one falling approximately 10 per cent., the full load voltage being 575 volts. Provision for a falling characteristic was required in order to provide for proper distribution of load among the company's various stations.

The specifications require the construction of the commutator



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and the connections to be such as to prevent any undue amount of oil collecting and injuring the insulation, and special effort has been made to provide a machine which can be easily repaired and kept clean. With this in view, the commutator spider is designed to permit a man to get at the rear clamps and to clean around the commutator leads from the back side of the machine. The field frame is arranged to slide to one side so that the pole pieces will be out of the way of the winding. This will permit of an inspection of the pole pieces and armature windings, and their ready removal in case of necessity. The commercial efficiencies guaranteed by the makers are as follows:—

```
89 per cent. at ¼ load,

92½ per cent. at ½ load,

94.2 per cent. at ¾ load,

94.8 per cent. at full load,

94.4 per nt. at 1¼ load,

94 per cent. at 1½ load.
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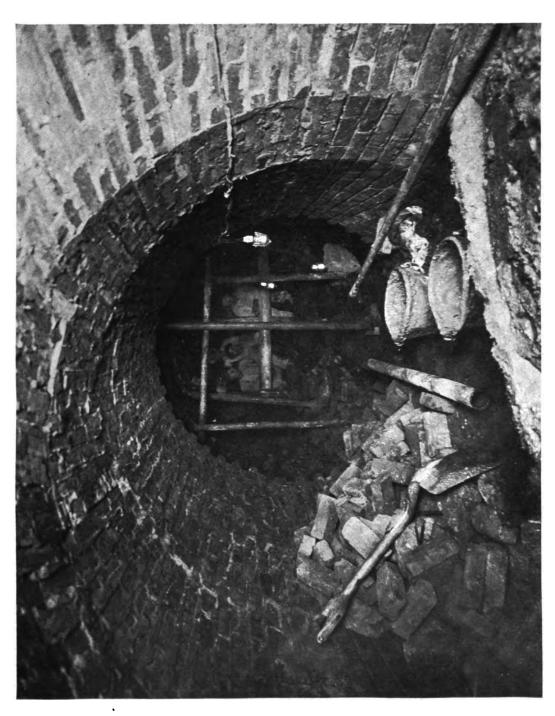
The temperature guarantees and the insulation tests specified are those recommended by the American Institute of Electrical Engineers.

The electrical equipment has no particularly novel features, but the type of construction will be the best which it is possible to install, and special care has been taken in the construction of the switchboard and gallery and in the arrangement of all interior cables to make the parts accessible for cleaning and repairs, and to insure as far as possible against accidents which might result in interruption of the service. The old switchboard was located at the level of the engine room floor, but is now being moved into its new location upon a gallery extending the entire length of the engine room. This work is being done by the Engineering Corporation's forces, who will also have charge of all interior cable work.

A new oil room has been constructed and a filtering system installed which will be of ample capacity for the entire station. The oil filters will be in duplicate, and will be made up of separating tanks and filters constructed of heavy sheet steel. The oil flows by gravity from the engines to the settling tanks, thence to the filters, where it is cleansed by passing through alternating layers of waste and wood charcoal, and is then pumped to elevated tanks in the engine room, from which it will flow by gravity to the various parts of the engines.

An interesting feature in connection with the work at this station was the construction of a tunnel to supply cooling water to the condensers. Heretofore, the cooling water for the plant has been supplied through a "suction" main. This was found to be inadequate for the requirements of the enlarged station, and it was decided to put in a gravity intake of sufficient capacity for the entire plant. Owing to the limited space for building operations, room could not be spared to use the open cut method of constructin, and tunnelling was, therefore, resorted to. The bottom of the tunnel is 19 feet below mean high water, and the entire work of construction was carried on with compressed air. Steel roof plates were used to prevent a cave-in from overhead, but the entire work was constructed without a head shield of any kind. The tunnel, which is 6 ft. in diameter and 210 ft. long, was completed in 56 working days without an accident of any kind.

The accompanying cuts show the method of construction and a portion of the completed work.



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AN INTERESTING DAMAGE CASE

By WALTER H. WALNE, Claim Agent.

Claim departments generally will be interested in those cases where we have been able to run down grafters. The most satisfactory case we have had in this line recently was that of Norma B. Sanford vs. the Dallas Consolidated Electric Street Railway Company. On July 22, 1905, suit was filed, in which it was alleged that on June 20, 1905, the plaintiff, while attempting to alight from one of our cars at Bryan street and Prairie avenue, was thrown to the ground by the sudden and violent starting of the car. We had no report of the accident, and inquiry among all of our trainmen operating on that line on that date failed to elicit any information concerning the alleged accident.

The case remained on our docket for over a year without our being able to get any clew that would aid us in defending the case; finally, however, like the parrot in the story, the plaintiff talked too much. In this way we learned enough of her past career to make her uneasy on cross examination, because she did not know how we "got wise to her," nor how much we knew. We asked her enough questions about her past history to let her understand that we were familiar with her record. The best thing we had, however, was the information we received, shortly before the trial, that this woman had taken out insurance just thirty-two days after the accident, that the medical examiner who passed her for the insurance in the order was also her family physician, and that she relied on this physician to furnish testimony as to her injuries. Of course we could surmise what was in that application. The case was to be tried on Monday, and on the previous Thursday the writer started for the headquarters of the order at Indianapolis. secured the desired application, and returning reached Dallas Monday morning at eleven o'clock; the case was called at two P. M.

First the plaintiff was introduced. She testified that she had been practically an invalid since the date of the accident. With-

out letting her know that we had the application, we asked her all of the questions therein, and in reply to each of the questions she stated that she was in very bad condition. Since it was unnecessary to lay a predicate to impeach the plaintiff, we did not have to show our hand before the doctor had his chance to testify. He went on the stand in bland ignorance of what he was going up against. He stated that he was in constant attendance on the weman for two months after the accident, that she was in bed a greater part of that time and had been an invalid practically ever since; that in his judgment her injuries were permanent. Still, without letting him know that we had the certificate, we asked him each of the questions asked therein, and in each answer he stated that the woman was in had condition. We then showed him the certificate with his signature, and that of the plaintiff attached, in which he had given contrary answers to each of the questions just asked him, and in which it was further certified that she had not had the service of a physician for any purpose within years, and that the malady for which she was last treated was measles.

This particular doctor was one who had testified in damage suits against the Company for a long time, and it gave us great pleasure to see him writhe and twist under a rigid cross-examination; his chair seemed to get warmer the longer he sat in it. The plaintiff then took the stand herself in rebuttal, and in her effort to explain her signature stated that she was not under oath at the time she signed the application for insurance, insisting that she was telling the truth now as to her condition.

The only testimony offered by the defendant was that we had no report of the accident.

It took the jury but a few minutes to return a verdict for the company. The plaintiff, her lawyer and her physician, have been wondering ever since what hit them.

We don't think this particular plaintiff will undertake a "shake-down" scheme against a corporation in this section again soon, and it is our judgment that we are permanently rid of one professional damage suit doctor.

ANOTHER LINK IN THE PUGET SOUND CHAIN

On the 1st of September the Puget Sound International Railway and Power Company assumed control and operation of the Everett Railway, Light and Water Company, in the city of Everett, Washington, under a lease running 999 years. By virtue of this lease the Stone & Webster interests add another, and the last principal city on that great Sound on the coast of western Washington, the shores of which, with the country immediately surrounding, have been the central scene in the remarkable drama of development which during the last ten years has been taking place in the new Northwest.

The first town location on the Puget Sound dates no farther back than 1845. Seattle and Tacoma, cities of the first class in population and in business, are just reaching man's estate, while Everett and Bellingham on the American side, and Vancouver across the line have but just entered their teens.

The city of Everett was incorporated in 1893. It received its initiative impulse from the Great Northern Railway, which in 1892 Luilt to the Pacific Coast and chose the location of Everett as a point for a good ocean harbor, and placed there large freight yards, repair shops and other adjuncts of its business. The city proper covers a peninsula four miles long and one and one-half miles wide, separated from the mainland on the eastern side by the Snohomish River, which finds its outlet into the sea at this point, and fronts on a large bay which makes in from the Sound, offering almost ideal conditions for ocean traffic. Everett is the county seat of Snohomish County, which lies in a very rich and fertile valley between the Cascades and the Sound. It is distant north from Seattle about thirty miles, which places it a like distance nearer the Strait of Juan de Fuca, the entrance to the Pacific Ocean. A combination of excellent harbor, with water communications to the sea, and agricultural lands, forests and valuable mines nearby is not common, and Everett is the entrepot of a region which must minister to its growth and development in a more marked degree in the future than it has even in the past. Within a district thirty-six miles long and twenty miles wide directly tributary to the city of Everett, the Monte Cristo, Great Lake, Silver Creek, Troublesome, Sultan, Stillaguamish and the North Fork mines send ores to the smelter in Everett, and the great timber belt lies within easy feeding distance of the shingle and lumber mills, which, located within the city, contribute so largely to its business.

The census of 1900 gave the city a population of 8,000. Conservative estimates place the present figures at 22,000, and if several small towns which are located within a radius of twelve or fifteen miles are included as practically within its suburbs, the total population served by the street railway system may safely be stated as 30,000 at least.

The business section of Everett is very well paved, the streets are wide, and the public buildings are of a good character. The land upon which the city is located slopes back from the water, giving a most excellent elevation for good drainage.

Over twenty sawmills and shingle mills, a paper mill, flour mills, four foundries and machine shops, planing mills, brickyards and shipyards contribute to the industrial activity of Everett, and in the last year or two a number of new enterprises have been established. The monthly pay roll at mills and other factories is reported to be \$209,110, covering wages paid to about 3,000 oper-The city's trans-continental connections, through the Northern Pacific and the Great Northern, and by through connections upon both these latter roads with the Canadian Pacific, give it a strong point of vantage, place it directly in the line of the trend of commerce, and make of it a prominent railroad center. The Great Northern road, in addition to the machine shops, roundhouses. bunkers, general offices and freight yards which it has located here, controls half a mile of the choicest ocean dock room on the bay, which inevitably means that at this point mammoth freighters will load and discharge their cargoes in the carrying on of the rapidly increasing business which has been established between Puget Sound and the Orient.

As the name indicates, the Everett Railway, Light and Water Company provides the city with electric railroad facilities, with electric light and with its water supply. The franchises have many years to run, and in point of equipment and service the company has kept equal pace with the growth of the city and its multiplying needs. The city railway lines cover about 13 3-4 miles including an interurban line operated from the city to a

small town known as Lowell, from which point the cars of the company use a leased track of the Northern Pacific Railway Company, terminating at the town of Snohomish, a distance of approximately 61-4 miles. The total track mileage of the company, therefore, including both city and interurban, is about 20 miles. The company has an excellent power station and its passenger car equipment of 17 cars is modern and well appointed. Its lighting plant, both in the matter of power and of distributing system, is in excellent condition, and for its water business the company owns a large watershed in the mountains near the city where it has a reservoir with a capacity of 6,000,000 gallons. This is supplemented by a reservoir in the city proper with a capacity of 1,200,000 gallons. The lighting and power customers number 2,193 upon meter and 150 upon flat rates, and its water connections are fed by 51 miles of water mains which afford most excellent service to its patrons. The company also owns some water power property which can in the future be economically developed, and this, supplemented by its steam apparatus, will furnish the company with ideal power conditions both for base load and peak.

The county over which Everett presides is one of the richest and most fertile and productive in the state for dairying, truckgardening, poultry and berry raising and general farming. The claim is made, and fairly well substantiated, that there are no failures of crops because there are no drouths, no need of irrigation and pasturage is green the year around. A farmer is better provided for profitable farming and comfortable living in the Everett region on a farm of five or ten acres than on the average large farm in the Middle West, and the tendency has been to cut up the acreage into small plats to be worked by individual owners, thus making for a larger population by far than that ordinarily to be found in agricultural sections. For this reason, and from the results which have been reached by interurban roads in other parts of Washington, we may with perfect safety assume that the connecting with the city by interurban roads of the small towns, of which there are a number, and even of the sections which are entirely agricultural, will be profitable from the start.

The Puget Sound International Railway and Power Company, which has become the lessee of the Everett properties, is the result of a very careful study by Stone & Webster of the urban and interurban possibilities of the country lying between Seattle and Van-

couver, a study which has been part of a more extensive and longcontinued investigation of the whole Puget Sound country for public service utilities. This line of investigation was adopted about 1898 and its first practical result was the purchase by the firm and their friends of the Seattle railway and light properties. By this time a fairly definite plan was perfected which led to the purchase and development by the firm of the electro-water power on the Puyallup River and the organization and construction of the Puget Sound Electric Railway between Seattle and Tacoma. Following hard upon this enterprise came the purchase of the Tacoma Railway and Power Company with its system in Tacoma, and even before the date of the securing of this last property the great plan found expression in the securing of the Whatcom County Railway and Light Company of Bellingham as a northern point in the electric scheme for the Puget Sound coast. The development of the properties named has been continuously progressing since they were acquired and the advance and growth of the country has been under constant watch and investigation by the firm and their representatives, who have placed their faith in the future of this region.

During the last two years a very careful special study has been made of that section of the country between the British Columbia line on the north and Seattle on the south, as well as between Tacoma, Olympia and Gray's Harbor in the region lying south and west of Tacoma and during the early part of the present year experts were sent to cover the field we have indicated for that purpose.

This examination covered the exploration of every possible route along the Sound contiguous to the cities on its shores; the visiting of every village and hamlet both along the water and in an area of country twenty or thirty miles to the eastward; and the collection and examination of data of all kinds as to growth of population, multiplication of industries, trend of travel, and the resources of the country upon which future possibilities might be based. As a result of the general plan and the more specific studies which we have mentioned, the Puget Sound International Railway and Power Company was organized in June last, for the purpose of building and operating interurban railways, lighting and power plants between the Canadian line and Seattle. As the first step in the development of this company's objects has come the lease by it of the Everett property, and the company also has

completed a survey for a railroad line approximately thirty-four miles south from Bellingham into the valley of the Skagit River, reaching the prosperous cities and towns of Edison, Bow, Laconner, Burlington, Mt. Vernon, Sedro-Woolley, Blanchard and Avon. Rights of way for this line are now being secured and as soon as conditions will permit, its construction will be begun. This particular stretch of land is intended to form the first link in the general interurban chain which shall tie together Tacoma, Seattle, Everett and Bellingham, as well as other smaller places to the north and south of the first and last-mentioned cities, and offer its railway and power facilities to the towns and the country of which each of these cities is the center.

The firm of Stone & Webster and their friends have been the electric sponsors to a very large degree of the Puget Sound cities, and their tributary region, and this on account of their faith in the future of that country. They have rested content to invest their own and to urge the investment of their friends' money in these enterprises, upon this faith, for no immediate return commensurate in any degree with the value and extent of their work has been received by them or their associates. It is a satisfaction, however, to take a leading share in the upbuilding of a section of our country so prepared and so willing to respond to efforts of this kind, and despite occasional discouragement and the sporadic exhibition of that sort of hostility which springs from political agitation and the unreflecting and unpatriotic action of those who join in the cry, "Down with corporations!" which spirit has at times hindered and impeded the extension and improvement of the local and the interurban enterprises of the firm, they have not in the main faltered in the prosecution of their plans as pioneers, plans which they formulated a decade ago and which they are as strenuously as ever pursuing.

The officials of the Puget Sound International Railway and Power Company are Ernest W. Purdy, Bellingham, president; Charles D. Wyman, Boston, vice-president; A. Stuart Pratt, Boston, treasurer; Alvah K. Todd, Boston, secretary; Stone & Webster, Boston, general managers. Selection of the permanent local manager and assistant treasurer has not yet been made. Mr. Howard F. Grant, manager of the Puget Sound district, has in his official capacity the general oversight of the Everett property and the Puget Sound International Railway and Power Company's holdings and operation.

A DIPLOMATIC SERVICE AS ALLIED TO A GOOD OPERATING SERVICE

By W. A. BUTTRICK.

We live in an age of quick and energetic thought, of most democratic, or to use a word which seems to suit the occasion better, of most autocratic thought; for each person surely demands that the "I" must be served, and served instantly and efficiently. No class of persons is more aware of this than the executive staff of any one of the Public Utilities, whether it be water, light and power, telephone service, or a transportation company.

It is quite true that the public, represented at times by some self-important, opinionated individual with a small grievance magnified into mountainous proportions, demands a great deal for its money; but more often it is the public's little feelings which have been hurt, and somebody's importance ground into the dust by the grasping octopus's heel, or even a conductor's heel.

The highest thought of the day continually keeps before us the fact that service of any kind is a privilege, and he who serves best has proved his right to go upward and onward in the great march of civilization toward perfection of development. A great public utility corporation has the privilege of serving the great public; and by all the laws which work themselves out continually for the general enlightenment of mankind, the best service will bring its own undeniable rewards. The writer has, however, at times entertained grave doubts as to the truth of this seeming platitude; nor is it entirely irrelevant to call to the attention of our friends advocating municipal ownership of public utilities the manifest logic contained in the foregoing.

To get people quickly and comfortably where they wish to go, means more people wishing to go; and in the same sense to give even and uninterrupted current at any and all times of the twentyfour hours means a continual use of the current for many purposes of mercantile and domestic service. A steady demand from the public for a high standard of operation should and does mean renewed effort to meet such demand, and an ever increasing perfectness of service.

In a combination company—railway and lighting—such as the writer is identified with, this is equally important in both departments.

The operation of a public utility, however perfect, cannot avoid some pitfalls, for such is the way of life; an instance of this is found in the fact that in the zeal of employes to carry out punctiliously their orders and to put through the operating service as laid down, they become mere machines, and some of the minor features of the service are lost sight of.

Obviously, it is most necessary to have an accurate schedule and that cars should, if possible, pass a given point at a given time; but that does not mean that the passenger ignorant of schedules—and most of them are ignorant of schedules—must be hustled off, or that the conductor should let his car fly madly past a would-be passenger who is making a reasonable effort to make the boarding point. A very irate lady was heard to exclaim on such an occasion, "These conductors don't want fares; they are too busy making schedules." Unfortunately the patrons of a street railroad company are not as exacting in keeping their own schedules as they are in demanding that the company keep its schedules.

It is undeniably true that the most perfectly organized operating service conducted without due regard to the private feelings of the individual will not reap the full reward which a broad-minded and thoroughly modern organization has a right to expect. There must be a diplomatic service also, and while this fact is perfectly well known and acted upon by the heads of departments, it is not so well understood by the rank and file of any company of this character.

One of the definitions of diplomacy is—dexterity and skill in securing advantages. Note that word advantages. A diplomatic service, therefore, would mean one in which skill in the form of courteous treatment and general acknowledgment of the individual right was used to secure the undoubted advantages of the good will of the people; something worth striving for from every point of view, and very essential in this business, and a point, I think, which is being recognized more every day by executives in this line. The public know they must have these things and are going to

have them; but by harmonious relations being established between producer and consumer and the good will of the consumer being assured, a necessity becomes a pleasure. Hence the welfare of the producer becomes of vital interest to all parties concerned, and the desire for success which each consumer begins to feel becomes a potent factor in the upbuilding and growth of the serving company along all its lines.

WEED BURNER

By G. H. CLIFFORD.

One of the most interesting experiments this season has been the development of an outfit to burn weeds and grass on the track between the rails and two feet on each side.

Our Interurban line traverses a very rich black soil, in which Johnson grass and Bermuda grass grow in abundance. This is very troublesome, and when allowed to grow to the top of the rails causes slick track and makes operation of trains dangerous, and in the past years it has been found very expensive to get rid of.

We mounted, on a flat car, three discarded storage air drums to be used as a crude oil reservoir, having a capacity of ten barrels, and piped the oil to burners under an air pressure of 70 pounds. The independent air line is then run direct to the burners in order to atomize the oil. Four burners are piped into a drum 8 ft. 8 in. long by 10 in. in diameter, with 6 in. opening in front of the burners. This drum confines sufficient heat around the burners to make almost perfect combustion. An apron of sheet iron is riveted to the top of the drum and extends back 6 feet over the track to hold the flame down on the grass; this sheeting becomes red hot and aids very materially in drying and burning the grass.

The entire burning outfit is suspended from two levers, one on each side of the car, and may be raised or lowered to meet any conditions. The air compressor in use has a capacity of 109 cubic feet, sufficient for supplying the air necessary.

Although the flame from these burners is intensely hot, we have had but little trouble with ties catching fire. Both sand and water are carried on the car to be used in preventing the spread of fire, and the burner is followed by a track walker whose duty is to see that the bridges and the ties are not allowed to burn.

Tests have developed the fact that it requires .8 of a barrel of crude oil to burn a mile of track with the burners moving about

2 1-2 miles per hour. When the grass is high and full of water it is necessary to go over the track twice to burn the grass completely up, but even under the most adverse conditions this is a very effective way of keeping the grass and weeds down. The expense of burning has been about \$200 per month this season, as compared with about \$900 per month last season. Inasmuch as the grass and weeds begin to grow in April and do not cease until September, the use of this weed burner has been a very material saving over the old method.

SNOW FIGHTING IN THE COPPER COUNTRY

By G. A. RICHARDSON.

Since much information of value and interest has been written regarding snow fighting on the large street railway systems, it may be that a description of the equipment used on The Houghton County Street Railway for battling with the snow, together with a few facts regarding the climatic conditions of the Copper Country, may not be amiss.

Our close proximity to old Lake Superior, by which this little neck of land is nearly surrounded, has a marked influence upon the length of the winter season, upon the amount of snow fall and upon the prevailing winds. The sudden changes of weather which occur without warning are also worthy of consideration, as a snow storm which at first promises to be a light fall of the "beautiful" may in a few hours prove to be a typical Lake Superior blizzard with extremely low temperature.

The Houghton County Street Railway Co. has twenty-seven miles of track, two-thirds of which are interurban. To keep this open in the winter months the following equipment is used: three single truck nose plows, equipped with G. E. 67 motors, one double truck nose with 4 G. E. 57s, one single truck rotary with 3 G. E. 67s, and one large double truck "Ruggles" rotary with 6 G. E. 57s.

During such a winter as the last, which was remarkable for its heavy snow fall, the small nose plows rendered very little service, on account of their light weight: unless backed by a four motor car, they were practically useless except for cleaning up after the rotary or the large nose plow. The low temperature experienced during these storms is responsible for a very frosty rail, and only very heavy equipment will free the ice from the rail in towns where the track is level with the surface of the street. For this purpose the large rotary plow gives the best results, and it is often run through the towns to give the cars a clean rail to run upon. This rotary has suspended underneath it at an angle of 45 degrees

to the track, and clearing it by about 2 inches, a large steel plate supported by heavy springs. The springs are strong enough to make the blade shave down the ice center between the rails very effectively, and yet if it strikes any portion of the track on curves or special work, the springs allow it to slide over without breaking. On each hood of this plow are two large iron wings, 6 ft. long by 4 ft. 6 in. wide, braced from the center of the body by a long, latticed angle iron arm. With these wings reaching out four or five feet on each side in front of the fans, this plow with good power can clear a path 18 feet wide through any drift. This rotary was our salvation many times last winter, as it clears a clean cut along the road, throwing the snow thirty or forty feet from the track.

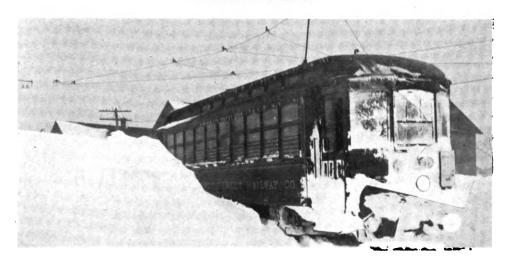
The large nose plow does most of the work, except in the early part of the winter and in the very severe weather, when it is necessary to use the rotaries. Its noses are raised and lowered by compressed air, effecting a great saving in time and labor over the old hand wheel lift. Midway of the body, on each side, is a large sheet-iron wing about six feet in length. With these wings out snow can be piled up ten or twelve feet alongside the track.

On one of our cars for the past two winters a small nose attached to the bumper and draw bar has given excellent results. This car has been used on one of the most exposed lines and has kept the road open better than any thing except the rotary plows. With the four motor G. E. 67 equipment and a good start this car goes through deep drifts without any trouble. At one point on this line the car descends a trestle into a cut fifteen feet deep, which is usually opened up every morning by the rotary, as the wind fills it in nearly level during the night. Owing to an accident to the rotary on two or three occasions, this car was forced to open its own way through this snow, which it did most successfully, although it filled the front vestibule to the circuit breaker and completely buried the motorman. It is intended to equip several more cars in the same manner for the coming winter.

As high ice centers through the towns cause a great deal of annoyance, we have, in addition to the ice cutter under the rotary plow, a home-made cutter installed on a flat car. This cutter consists of a beam, set at an angle of about 30 degs. under the center of the car, on which are placed large steel cutters, similar to large parting tools. Two or three rows of these tools are used, so that there is a cutting edge about every three inches across the track. The entire tool beam is raised and lowered by a lever on top of the

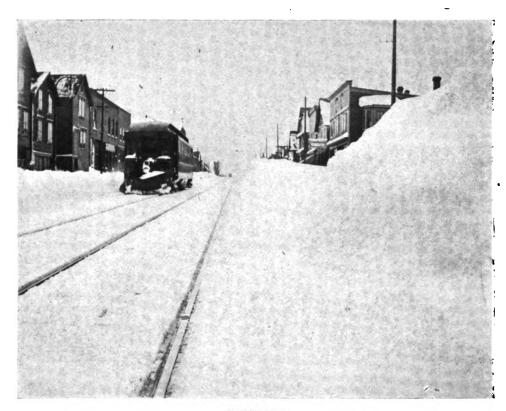


WOLVERINE LINE

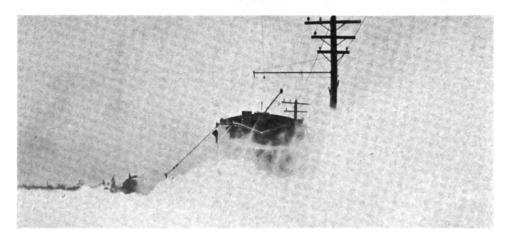


, THE "ARCTIC ROUTE"

Leaving Albion Transfer Station for Wolverine



CALUMET



car, and when sufficient weight is put on the car to keep it on the rail the cutter gives excellent service. The cutter car is towed by a four motor car and is followed by a small nose plow to remove the ice.

As we have no shear plows in our equipment, the removal of the ridge of snow between the double tracks presents quite a serious problem. Formerly this work was done by horse scrapers, but as time was only wasted in doing poor work and our expenses were materially increased by the necessary horse hire, we use at present a long wing attached to the center of our nose plows and held at the proper angle on the outside end by a chain which hooks on to the forward nose of the plow. This wing is long enough to push the ridge over beyond the center of the other track, and the plow returning on that track removes the accumulated snow, leaving both tracks clear.

The road is exposed in many places, and owing to the high winds which prevail most of the time the hardest snow fighting is often done when the sky is clear, as the fine dry snow driven by the wind soon fills in the cuts cleared by the plows. Several miles of portable snow fence have been of great assistance in protecting the more exposed sections, but even these fences are useless when drifts fifteen or twenty feet high have accumulated behind them. To dig out the fences and replace them requires no small amount of work, and it sometimes happens along toward spring that they are completely buried, as storm follows storm in such rapid succession that every available man is required just to keep the road in operation.

It is necessary in the towns that the accumulated snow be removed from the streets. This is done by the towns themselves, at their own discretion, and we are called upon to pay half of the expense. These snow bills are no small item in our total snow expense. It is fortunate that this snow is taken care of in the towns, especially where there are double tracks, as the roadway on the side of the street often reaches a point on a level with the windows of the car.

It would undoubtedly appear strange to one unaccustomed to the conditions, to see plowing (a man, with a regular farm plow) being done in the streets during zero weather. Such however is the case here during the winter, in order to break up the packed snow and reduce the level of the roadway to within a couple of feet of the car tracks. This is very expensive, as the work progresses slowly. Often, only one side of the street is kept in a passable condition, while the snow banks on the other side resemble a small mountain range with their numerous drifted peaks. The walks for pedestrians are never plowed in this country but follow the drifts, which may be high or low according to the spirit of the wind. Large horse rollers are used to make the walk hard, and a scraper is employed to scratch the surface to keep one from slipping. It is interesting to a passenger to sit near a window and watch the people wending their way along a path on the level with the car windows and to see on the other side of the street sleighs passing on a friendly level with the eye.

This past winter was the most severe in the annals of the company, and though it did not begin in earnest until the middle of January, it lasted until the middle of April with scarcely any let up! The temperature stays so low that snow that comes in November often stays until April. As furnishing an idea of what this means the following table of snow fall for the past six years, which is extracted from figures compiled by Mr. E. S. Grierson, weather observer for the Calumet & Hecla Mining Company, will undoubtedly be of interest:

SNOWFALL IN INCHES IN CALUMET, MICH., FROM 1901-2 TO 1906-7.

Winter Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	Total.	Ft.& In.
1901-2 1902-8 1903-4 1904-5 0.25 1905-6 6.25 1906-7 1.00	15.00 9.00 39.00 15.25 24.25 19.67	31.00 52.00 52.00 55.50 31.00 35.15	43.00 22.00 33.50 37.00 22.00 39.00	24.00 24.00 11.00 14.50 27.00 10.00	12.00 11.00 21.00 7.50 25.00 16.50	7.50 18.00 10.50 5.50 0.50 35.00	3.00 3.00	132.50 139.00 170.00 138.50 135.00 171.50	11.7 14.2 11.61/2 11.8
Mean fall for past 20 yrs. 1.65	19.67	35.15	34.75	19.55	14.08	6.92	1.35	133.13	11.1

For the ten days ending April 16, 1907, 35 inches of snow fell, and owing to the lateness of the season we were caught unawares. Drifts ten to fifteen feet high were formed by the high winds, and for over a week the rotary plow was constantly in commission.

It would be hard to find a more loyal hard working lot of men than our trainmen. They are not only willing but more than anxious to keep the lines open during the hardest storms. In many instances men have resorted to hard manual work with their shovels in order to get their cars through, where a less loyal crew would have been content to toast their toes on the car heaters until help arrived.

Our conditions here are certainly severe, and we often wonder, when the storms are over, how we managed to pull through, and usually decide that to the indomitable courage of our men the credit is due.

REWINDING FIELD COILS

From Mr. Campbell, master mechanic of The Seattle Electric Company, we have the following response to a question as to the kind of wire employed, and the method of its application, by The Seattle Electric Company in winding of field coils, and we present the same as being possibly of interest to our companies.

Mr. Campbell says:

"After a considerable amount of preliminary investigation, in May, 1904, we began the use of Deltabeston wire for field coils, and having given it for a time a test on field coils of certain types, we adopted it for all our field coils and have since used it exclusively, with the exception of some brief periods when we were unable to obtain it and had to have recourse to double cotton covered wire. Our experience with Deltabeston was that it fulfilled our expectations, with the exception that some trouble arose because of the wire working loose in the fields.

"In April, 1906, our attention was called in one of the street railway papers to a mixture of whiting and black Stirling varnish for use in connection with field windings, and we made a test of this mixture, hoping that it would improve the insulation and increase the life of the fields. The proportions we used were 5 pounds of whiting and one gallon of black (plastic) Stirling varnish, for a set of four coils. As the wire is wound on the form we paint each layer with the mixture, and after the field is completely wound and taken off from the form it is painted all over with the same mixture and baked in an oven for fifteen hours at a temperature of 175 degrees F. Following this we insulate it with three layers of linen tape and two layers of Empire oil cloth, and finally paint the outside with black Stirling varnish.

"This practice seems to hold the wires rigidly in place and obviate all chafing, so that we find the coils that have been made in this way and have been in service the longest are as solid and apparently in as good condition as when they were first wound.

It is true we have not had this method of wiring fields in use long enough to speak with great definiteness as to what the results will be, but we are inclined to believe that fields made in this way will, in default of some great exigency, prove practically indestructible. It is possible that double cotton covered wire, if treated with the mixture we have suggested, will approximate the same results as the Deltabeston wire, though in practice we prefer to use the latter and thus, if possible, make assurance doubly sure."

DAILY METER READINGS AS APPLIED TO ELECTRIC LIGHT AND GAS COMPANIES

By H. B. SEWALL.

In changing from monthly to daily meter reading, the first question usually asked is, "How will it affect your relations with the customer?" That it will be a saving to the company is at once conceded; but will the customer, who has been accustomed to paying all of his bills, including electric and gas, on the 10th or 15th of the month, as the case may be, take kindly to a change of system allowing him ten or fifteen days from the date of his bill, in which to take advantage of the discounts?

While most electric and gas companies allow a liberal discount for prompt payment, the customer is prone to accept it as such, being apt in the majority of cases to consider the net rate excessive; but the experience of those companies who have tried reading meters daily, shows that only a small percentage of the customers are put to any inconvenience by being asked to remit during the month instead of after the first when other bills are due; and as soon as it is explained that they will receive their bills each month the third day after the meter is read, instead of from ten to fifteen days under the old system, there are but few who insist on having their bills rendered the first of the month. In arranging the routes the business district is of course read as near the first of the month as possible.

The city may be divided into twenty-six (26) sections, represented by the letters of the alphabet, and corresponding with the working days in the month. Each section is then divided into routes, which are increased in number as fast as is warranted by the increase of business. The meters in section "A" are always read on the first day of the month, each meter reader taking a route. Two days are allowed for the billing and book-keeping departments to make out and enter the bills, and these two days take care of the intervening Sundays and holidays. The bills are

then ready for delivery on the third day after the meter is read. It has been found advantageous to place the bills in envelopes, using a patent envelope with transparent address, as it insures as safe a delivery as through the mails. Delivery is made by boys at a saving of about 75 per cent. of the cost of postage, and the boys are also competent to read the meters missed by the regular meter readers.

Section "A" having been delivered on the 3rd of the month the discount will expire on the 13th, and other sections on corresponding dates.

The customer then knows that his discount will always expire the same date each month unless he should change his location, when due notice will be given him. Three days are allowed after the expiration of the discount date to take care of belated checks received through the mail, and the statements are then made out by the book-keepers and given to the collectors, who follow the same routes as the meter readers.

The advantage of this system will be readily seen for the following reasons—First, in regard to credits: Should the meter be read on the 20th of the month and the bill not rendered until the first of the following month, 10 or 15 days being then allowed for taking advantage of the discount, before a collector can see a customer whose credit is questionable, nearly two months' bills or more have accrued. Under the daily reading system, a delinquent may be seen within two weeks after the meter is read, and the result is that the losses are materially reduced.

No extra help is needed at the last of the month in the Billing Department, nor until the 10th or 15th of the month in the Cashier's Department, as approximately the same number of meters are read each day, and the same number of payments received. The number of meter readers, bill distributors, bill clerks, book-keepers, cashiers and collectors remain the same, increased only as is warranted by any increase in business. As nearly the same amount of work is accomplished each day, more efficient service is received, and there is less chance of errors on account of extra work being crowded into a few days. This is also true of the meter readers, as there are apt to be less mistakes in reading when men are continually employed at the same work, and are not taken off of work at the end of the month in order to read all of the meters in ten days.

With the use of this system also, the meter readers having

steady employment, may be under the jurisdiction of the Accounting Department, and errors in reading taken up directly with them instead of passing through the Operating Department as was necessary under the old system. The cash receipts are more evenly distributed during the month, and the cash balance is not inflated at any special period. While the number of complaints are not necessarily diminished, they are distributed more evenly over the month, and are not aired before a line of customers waiting to pay bills, as experience has often shown to be the case. There is also a saving to the Operating Department, inasmuch as the Meter Department is not called upon to drop any particular work during the last ten days of the month, and take care of the meter readings.

This department also profits by this system in the exchange of lamps, which is more evenly distributed over the month, for, as a rule, customers exchange their lamps at the time of paying their bills. As it is also necessary for our customers in paying their bills to pass through the Display Department, more time may be given to each individual customer in explaining the advantages of the different classes of lighting and heating apparatus, which of course would be impossible were they to pay the majority of their bills during the first ten days of the month.

The result is that the work is more evenly divided and better results are attained in each department, and it is not improbable that it is only a question of time when this system will be adopted by all electric and gas companies in large cities.

A COMPACT ALLEY UNDERGROUND SYSTEM

By R. P. GIFFORD.

The village of Red Jacket is situated in the northern part of Houghton county, Michigan, in the midst of a group of copper mines and directly adjoining the famous Calumet and Hecla mine. The village, although small as regards area, is nevertheless a most thriving town, being the trade centre of the surrounding mine locations and of the rapidly growing Keweenaw county, with its numerous copper developments.

Early in the year 1905 the village council determined to pave the main business street, which at that time was lined on each side with telephone and lightning poles, the latter, in particular, carrying through feeder lines in addition to the local circuits. Several progressive citizens being on the Council, one of the first steps decided upon was the removal of all overhead wires and the use of ornamental arc lamp poles at street corners, the lamps to be fed by underground cables

The streets of Red Jacket are laid out at right angles with alleys between those running north and south, and therefore it was an easy matter to clear this street by running pole lines in the two parallel alleys on the east and west, changing the service wires to the rear of the buildings, while the arc lamps were fed by single duct conduits as described below.

The improvement was so great that a strong movement was at once irangurated to continue the good work by paving every street and installing cement sidewalks throughout the entire village. Although this was opposed by the various interests to whom the change would mean heavy construction expenses, the idea rapidly gained ground, and as the town was burdened with a lack of debt

and a superabundance of credit the final result was an order to the public service companies to have all poles removed from the streets by May 1, 1906, and a closing of contracts for paving all streets and sidewalks.

It was deemed best by the council for the village to install and own all conduits, lamp-poles, man-holes, etc., for lighting use, and to rent the system to the lighting company on a time basis. A free hand was given, however, to the lighting company as to the laying out of the system, the number of ducts and man-holes required, etc., the only specification being that fibre conduit be used. This clause met with opposition from the lighting company at first, as the conduit was to be for both high and low tension cables, but after a consultation with the village engineer a very liberal cross section was agreed upon which gave such ample concrete barriers between pipes that trouble was out of the question. If any one of the fibre pipes was destroyed at any point by a short circuit, a concrete duct would still remain which would be exactly as good as the usual vitrified duct.

As before stated, the streets are located at right angles, with alleys parallel to those running north and south, and this allowed for a very compact system being installed with a minimum expensive underground work.

Taking the alley running through the principal business section of the town as the centre, the primary feeders and the through lines from the station were brought in at the southern end of the alley and carried throughout the entire length on a 50-foot pole line, with the necessary transformers installed at various places to hold up the pressure. As the buildings in the remainder of the village were lower, smaller poles could be used and a 30-foot pole line was installed in each of the remaining alleys.

Time was a strong factor in this changing over, as the paving contracts were split up between two concerns, neither of which would permit of any delay in the carrying out of their portion of the work. As we had determined to do the work with our regular crews along with our regular operating, it was therefore necessary to start in the middle of a Copper Country winter. Anyone who has spent a winter in that country knows what that means; sufficient to say that the first alley line (started early in January) required digging through from five to seven feet of snow before ground was broken for the poles. This line was installed with the cross-arms spanning the poles in the usual manner, but in the rest

of the alleys the arms were offset, oringing all the wires on the alley side of the pole and well away from the buildings.

To connect these various alley lines with the feeders in our feeder alley, it was decided to use the second of the cross streets as a combined feed for two phase primaries, secondary, and arc circuit, while on the fourth cross-street a secondary tie cable was installed, and on the sixth cross-street (as yet unsettled and not to be paved) provision was made for an overhead secondary tie for future use. Arc circuits were run in the second, fourth, and sixth alleys with underground leads from each, at street crossings, to the intersecting street corners. In certain long blocks arcs were placed midway of the block, the underground lead from alley lamp running along the property line, permits for this being obtained from the property owners by the village authorities.

By the use of the foregoing method the secondary system was well balanced, the arc lamps cared for, and two phase primary current rendered available for every alley, while the actual amount of underground installation was reduced to two cross streets, with various short single duct runs on all cross-streets for the arc system.

The arc lamps were definitely plotted out, using the lamp at the town hall as a starting point and staggering the lamp poles from side to side in passing down the streets, thus getting the best light distribution. At all street intersections an extra duct lead was laid leading to the opposite corner to that on which the arc pole was installed, so that the present lighting can be doubled at any future date.

Extra through ducts were installed for future growth, and at all alley man-holes extra exit ducts were placed and conduit run to the first alley pole to allow for any expansion desired, as for example running two phase primaries in any alley.

The wisdom of this step has been shown recently, for it has been found that the original plan of a primary line in every other alley with interconnected secondary in every alley will not hold the voltage in the western part of the village, and we are now running an additional primary in one of the odd alleys passing through a thickly settled district. As this extra duct and alley bend were put in when the original work was done this addition is now a very simple matter.

The material used for the duct was the so called "fibre conduit," which is made from wood fibre treated with an asphaltic

compound which renders it acid, alkali and water proof. The sections fit together with a bot car binder and the pipe is easily and rapidly laid, giving a smooth continuous tube of 3 inches bore.

The method of laying the duct was as follows:

A 4-inch layer of concrete was used as a base, then the first layer of ducts were placed with a 3-inch barrier of concrete between parallel ducts and a 4-inch barrier between the outer ducts and the sides of the trench. Then a second 3-inch layer of concrete acted as a bed for the next row of duct, etc. A top covering of 4 inches of concrete was laid in all cases and the trench was dug deep enough to allow of a 3-foot minimum depth from street surface to top layer of concrete. Where only a few ducts were installed the cross section varied, but these figures for space between ducts and between ducts and sides of trench were followed throughout the work.

Man-holes were installed at all street intersections to allow for the running of the arc leads between man-hole and lamp pole, and at all alley intersections for the leads running to the alley poles and thence to the overhead alley lines. These man-holes are oval in form, with solid iron covers. They are built of two courses of brick, and vary in depth, the aim being to have, if possible, at least 2 1-2 feet clearance between the bottom duct row and the bottom of the man-hole. As the streets were badly congested with fire-alarm, telegraph and telephone man-holes and ducts, the lighting company man-holes average about 4 1-2 feet in diameter, but this is not as confined as would at first appear, for the number of cables passing through the man-holes is small and will never be much greater. In view of this limited space and small number of cables, the usual plan of running brick shelves around the sides of the man-hole was abandoned, and instead single 2 x 4 timbers were lagged to the middle of the man-hole side walls, and iron supports, made locally, lagged to these timbers for use as cablehangers.

As the ground was naturally dry, no sewer connections were installed, and the test of a long six months' winter with a very bad spring break-up proved the natural drainage to be satisfactory in all but one man-hole. This hole was located very near a swampy hollow which acted as a catch basin for the surrounding land, and the water soaked very rapidly through the man-hole wall and along the ducts leading to the pole, this last condition evidently being due to poor workmanship when laying the duct.

It was found necessary to connect this man-hole with the sewer, and since then no trouble has been experienced.

The various cables used were as follows:

Primaries. No. 4 B. & S., stranded single conductor, with 4-32 inch rubber plus tape insulation and 5-64 inch plain lead sheath. Suitable for 2300 volts working pressure.

Secondary Service. No. 1-0 B. & S., 3 conductor stranded cable, each conductor insulated with 5-64 inch rubber, tape covered, and the bunch tape covered and then sheathed with 3-32 inch plain lead. For 230 volts working pressure.

Arc Service. No. 6, 2 conductor stranded, rubber and tape insulated and lead sheathed. For 3500 volts working pressure.

At the junction of overhead lines and man-hole leads the usual bell joints were made on all high pressure circuits, and on such loops of the series are circuit as gave a potential difference of sufficient magnitude to warrant these bell joints were protected by wooden boxes attached near the pole tops.

The first secondary joints between underground leads and overhead lines were made by an ordinary wire wrap joint, well taped and coated with insulating compound, and have given complete satisfaction as far as the electrical aspect is concerned. The drawback of this method of making joints was that if it was necessary to disconnect the underground secondary from the overhead alley lines for testing, etc., it required the breaking of the joint and all the labor of re-jointing. Up to the beginning of the work we had been unable to find any satisfactory pot-head device, but shortly after the work was underway we learned of the Garton three-conductor porcelain pot-head, tested same, and have installed them on all overhead taps since that time. This pot-head is compact, of good appearance on the pole, and gives a very ready means of disconnecting and connecting any alley in case of need. To date they have proved very satisfactory in every way.

The usual method of connecting man-hole and pole lines by iron bend, threaded to 2 1-2 inch iron pipe, was used, the pipe being carried to the lower cross-arm and painted with a protective asphaltum paint.

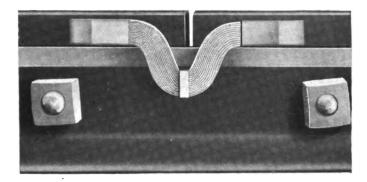
The original scheme of arc connection was to run the lead cable from the man-hole to the lamp base (carrying it well above the sidewalk) and then splice on heavy Okonite wire by the usual splice and compound joint, the idea being to save on the expensive lead cable. This method was satisfactory for a time, but after about ten months' use the joints began to give way, due partly to water running down the wire and penetrating the joint in spite of every care, so that we have changed our method of connection and now run the underground cable clear up the lamp pole to the lamp terminals, stripping back the lead sheath for a distance of a foot or two at the top.

Owing to the pressure of other work no system of cable sheath grounding was installed, but we are now arranging to run a bare copper wire throughout the entire underground system and to connect the lead cable covers to this ground wire in the various man-holes. Then at each alley man-hole a ground wire will be tapped to this common ground wire, and led out, through one of the extra ducts, to the alley where a ground plate will be installed. The through copper wire could be omitted and the cable grounded as above at each man-hole, but it is not thought best to depend wholly on any one ground, as plate grounding is more or less uncertain, and the through wire tends to make the grounding more dependable.

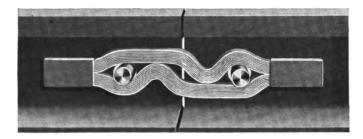
It is also our intention to wrap all cables in man-holes with asbestos and then paint the wrapped cable with some non-inflammable enamel paint, thus preventing trouble in any one cable extending to the other cables in the man-hole.

As this was the first underground electrical work installed in the Upper Peninsula, it was an unusually interesting proposition. It was entirely new work to all the employes; thus it was necessary to carefully instruct all the men in the jointing, pulling cable, etc. The whole installation was made by our own regular crew, even to the wiping of the joints, one of our linemen being instructed and trained to do all this work.

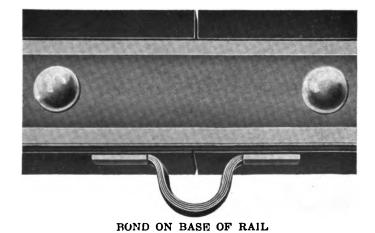
The system has now been in operation for over a year and has given very good satisfaction.



BOND ON BALL OF RAIL



BOND ON WEB OF RAIL.



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BONDING EFFICIENCY

By R. H. McGRATH.

To entirely eliminate electrolysis is impossible, but the percentage of leakage at the rail joint can be reduced to a minimum by the use of an efficient bond properly applied.

In the present stage of railroad development, when such strict supervision must be given to detail in order to reduce operating expense, it is surprising to note the lack of enthusiasm shown in connection with such an important item as the bonding question, and often it is not until demonstrative tests are made that the real value of proper bonding as a means towards cost reduction presents itself.

Exhaustive tests covering resistance, flexibility, and shearing strain, conclusively prove that the best bond under all conditions is the soldered bond; constructed of a number of copper strips about 1-40 of an inch in thickness, each separately tinned at the ends, clamped together, tinned and covered with a wrappered foot with contact area equal to capacity of the bond itself; formed in the shape of a loop to allow for contraction and expansion of the rail and properly soldered to each rail as near the joint as possible.

Such bonds may be applied to either the ball, web or base of rail with equally good results, or may be concealed under fish plate to avoid loss by theft. Bonds applied to the different positions on the rail demand different shape of loop to obtain the necessary flexibility.

The accompanying cuts represent some of the standard shapes as applied in the most efficient positions.

The secret of success of the soldered bond is—proper application. This is obtained by the following method:—each rail is first thoroughly cleaned by means of a carborundum wheel or by sand blast at the point where foot of bond is to be applied; the rails are then heated by means of a double burner gasolene torch and a thin coating of solder applied with zinc chloride flux; the

bond is clamped into position, solder is allowed to run onto the contact surface, and extreme heat is applied to rail to melt the coating of solder; the rail is then cooled by applying water. With such application the bond will withstand years of hard usage, is not affected by weather conditions, crystalization or fluctuating loads and stands a shearing strain of two thousand (2000) pounds applied to either foot. The resistance of bond and joint should not exceed three feet of rail used.

After seven years of continual service under varying conditions the soldered rail bonds manufactured and applied as above described by the Chase-Shawmut Company of Newburyport, Mass., prove by the constantly increasing demand their superiority over the plug bond, not only in high efficiency when first applied but in cost of maintenance and percentage of depreciation after years of service.

METHOD OF PREVENTING ACCIDENTS

By J. S. HARRISON.

In Florida the law places the burden of proof upon the company to show that it has exercised all ordinary and reasonable care and diligence, the presumption in all cases being against the company; consequently in all cases, whether for property or injury to person, the company must prove, to the satisfaction of a Florida jury, that it was "Not guilty."

With this state of facts staring the claim department in the face, it was up to that department to find some method of preventing accidents.

First, cards 11 in. x 21 in. bearing this wording were secured: "Avoid Accident. Wait Until the Car Stops." And on the left-hand end of the card there is a cut showing the proper way to alight from a car; and on the right-hand end, the wrong way, showing the usual result. Cards were placed in each end of the cars.

Starting in June a course of lectures was given the trainmen, by the claim department, using as a guide Mr. F. W. Johnson's pamphlet, "The Prevention of Accidents." These lectures consumed one hour; and each trainman was given a copy of the pamphlet to study, and after having had a sufficient time in which to go into the book thoroughly, he was examined upon the different subjects treated therein. The pamphlet is in no way a rule book, but is in every sense an ordinary text-book, laying a suitable foundation for the work of instructing trainmen practical means of preventing the more common class of accidents and concerning the proper handling of accidents.

The pamphlet treats upon:

The Accident,
The Accident Report,
Witnesses to Accidents,
Courteous Treatment,
The Prevention of Accidents,

Rear-end Collision of Cars, Collisions with Teams, Unnecessary Conversation, Passing Standing Cars, Stepping from Moving Cars, Rcticence, Starting on One Bell, Accidents to Children, The Gong, R. R. Crossings, Cars Hitching Along, Safe Landing Places, Open Car Accidents, Side Bars, Defective Car Appliances, Pointer in General.

The trainmen are taken in classes of from ten to twenty mendaily, and have thus far shown quite an interest in these lectures and seem eager for information concerning this important branch of street railway work.

At this time it would be hard even to estimate the amount of good that will come from these lectures and examinations, but it is the earnest hope and desire that much good will be accomplished.

The legal department, under the head of Messrs. Kay, Doggett & Smith, and the medical department, under Dr. Paul C. Perry, are working hand in hand with the claim department, all looking toward the same end:

Less Accidents, Fewer Accidents, No Accidents at all.

And in case of accidents, immediate investigation, determination of liability, honest dealings, confidence of our patrons and the friendship of all.

BELLINGHAM TRIES MUNICIPAL OWNER-SHIP ON A SMALL SCALE

By L. H. BEAN.

In the early days of electric power transmission, when the value of water power as a means of producing electric energy was but little understood, the city of Bellingham purchased at a high price a water-fall at the mouth of Whatcom Creek, which fall is located near the center of the city. No expert examination was made of the possibilities of this power before purchase, and the officials and many citizens were under the impression that they had a very valuable water power which could be used to light the city when it had become rich enough to install and own its own electric lighting system. Fortunately the city did not find itself in position immediately to install its lighting system, and partly to utilize its water power a lease was made to a planing mill by which the mill could use sufficient water to produce 40 horse power. A Leffel turbine of 40 horse power was therefore installed and, to the great surprise of everyone, it was found that during the summer months the entire flow of the stream would pass through this wheel.

The stream in which the fall is located is the outlet of a large lake from which the municipal water supply is taken; a portion of the city is built on land too high to be supplied from this lake, and it was found necessary, therefore, to pump water from mains leading from the lake to supply this high district. As the supply needed for this district increased with the rapid growth of the city, the cost of operation of a steam pumping plant for this purpose became a serious burden on the water department, and the city authorities concluded to make an attempt to use the power of the falls above described by installing a 140 H. P. turbine water wheel belted to a 75 Kw. three phase generator at the falls and transmitting the power so produced a distance of three-fourths of a mile to the pumping station, at which point the power would be

used to drive a 75 H. P. induction motor direct connected to a three step centrifugal pump. To avoid the summer shortage of water, a dam was built across the lake outlet which would raise the surface of the lake three feet and thereby impound the surplus water of winter for use in the summer.

After a great deal of trouble and numerous break downs, the plant was finally started and for a short time worked fairly well. Then mechanical and electrical troubles commenced to develop and it was found impossible to keep the pump running more than half time owing to such troubles. A number of claims for damages were filed against the city, and various law suits were threatened in consequence of damage to lands and structures on the lake shores, resulting from raising the surface of the water. The city was obliged hastily to remove its dam, and in consequence there was soon no water to operate the turbine, and the city was forced to resume continuous operation of its steam pumps. In this emergency the city officials, thoroughly disgusted with municipal ownership, appealed to the local electric lighting company to take the apparatus off their hands and operate it. A contract was therefore made and the company immediately repaired the pump and is now successfully operating it with power supplied from its plants.

NOOKSACK FALLS DEVELOPMENT, BELLINGHAM. WASH.

By L. H. BEAN.

Up to the fall of 1905 the Whatcom County Railway & Light Company controlled the street railway and gas systems of the entire city and was doing the electric lighting business of the south side of Bellingham. Negotiations were completed by Messrs. Stone & Webster in September, 1905, whereby the lighting and power property controlled by the Bellingham Bay Improvement Company was acquired. This property carried with it water power rights and property upon the Nooksack River near the Nooksack Falls in Whatcom County about 47 miles from Bellingham, which are located seven miles from the eastern terminus of the Bellingham Ray & British Columbia Railroad and consist of a vertical fall of 110 feet and a series of cascades below and within onequarter mile of the falls, which makes available for water power purposes an effective head of 173 feet. When the transfer of these water privileges was effected steps were at once taken to develope the water power for the benefit of the Whatcom Company and the work was commenced by the Stone & Webster Engineering Corporation on October 1, 1905, and electric power was first transmitted to Bellingham September 21, 1906. Both in the matter of time and cost the installation was well within the estimates and the Whatcom Company congratulates itself upon securing a power plant intelligently planned and economically constructed. The general plan of development consisted of diverting water from the river by means of a dam and masonry intake at a point about 200 feet above the falls and conducting it in pipe lines, laid through tunnels and on rock cuts along the sides of the canyon below the falls, to the power house, which is a concrete and steel structure located 1500 feet from the point of diversion described. At the point of diversion the intake is fitted with heavy rack bars spaced one foot centers; the water entering the intake passes through.

the head gates into a tunnel driven through solid rock for a distance of 300 feet. At the lower end of this tunnel the water enters a forebay, where it is brought nearly to rest for a short period of time to allow sand and gravel to settle to the bottom of the forebay, from which it is removed by waste gates; the water then passes through rack bars spaced three-quarters inch and enters two parallel pipe lines which conduct it to the power house. At the power house the pipe lines are joined together with a Y connection and are connected to a Platt Iron Works Francis Turbine of 3300 horse power, which is direct connected to a 1500 Kw. three phase, 2200 volt, 200 R. P. M. Westinghouse generator. The step-up transformers are located in cells in a separate reinforced concrete building, located about 100 feet from the power house; the generator voltage is here stepped up to 22,000 volts and electric currents are transmitted at this voltage to Bellingham 47 miles distant. The transmission line consists of three stranded aluminum conductors, each having conductivity equivalent to No. 2 copper: poles are spaced on tangents 140 feet; insulators are the Stone & Webster 60,000 volt type and are carried on steel pins. A telephone circuit consisting of two No. 10 copper conductors is also carried on the transmission line poles. At Bellingham the voltage is reduced by step-down transformers, located in concrete cells in a brick and steel sub-station building, to 2200 volts, at which voltage it is supplied to the primary circuits of the electric lighting system and to a 500 Kw. motor generator set which furnishes 500 volt direct current for operation of street railways. A unique feature of this installation is the connection of a 1200 H. P. steam engine to the motor generator set by means of a 72 inch triple leather belt; in case of interruption of water power the closing of a clutch enables the engine to drive the motor generator set and either or both A. C. and D. C. current can be produced as desired.

This development was under the immediate direction of Mr. S. L. Shuffleton, constructing engineer for the Engineering Corporation. Mr. Shuffleton is the hydraulic expert for the Puget Sound district.

ELEMENTARY NAVAL ARCHITECTURE

By R. H. McGRATH.

Among the readers of the Public Service Journal, there are undoubtedly many whose instinct and inclination incline them during their leisure moments to enjoy the real pleasures of yachting. Few, however, realize the amount of calculating, estimating and experimenting which is involved in order to produce a successful craft.

A radical departure from the already successful type of yacht generally results in an utter failure, though it may sometimes prove phenomenally successful. It is for this reason, therefore, that most naval architects prefer to reach their ideal by gradual development from a standard type. When it becomes necessary to produce an entirely new creation, one of two methods is resorted to; either to compile the desired information from the experience and data furnished by some similar craft, or to take as a basis the desired displacement, and by laying out what is known as a "curve of areas" to design first the underwater body, then the topsides, sail plan, etc. This last method, although wholly technical, gives remarkably good results if the designer puts into use all the practical knowledge in his possession.

Having decided on the general shape, and taken into consideration the three foremost requirements, namely, seaworthiness, speed and accommodations, the "lines" are then "faired up," so as to give least skin resistance and eddy-making, and, at the same time, the necessary stability at the various angles of keel. Stability may be obtained either by placing the ballast on the extreme lower portions of the boat, thereby lowering the center of gravity, or by doing away entirely with ballast, depending on extreme beam to produce the desired results. The fastest yachts of today depend on beam for stability; the best, all-around crafts, however,

form a compromise, having moderate beam and comparatively highcenter of gravity of ballast.

The power to carry sail varies directly with displacement and stability, and, in fact, a formula to this effect is used by certain architects; but the most practical way is by direct comparison of the total areas of yachts already in commission. When the total area has been ascertained and the most efficient style and shape decided upon, the next step is to balance the sail area so as to get the best results under varying weather conditions. The technical method of getting this balance is to place the center of sail area, known as the center of effort, at a certain distance from the center of lateral resistance of the hull. This distance varies with the different rigs and shapes of the underwater body, but, generally speaking, the center of effort should be slightly in advance of the center of lateral resistance, which should be about fiftyseven per cent. (57 p. c.) aft of the forward end of the load waterline. As upon the relative positions of these two centers depends the ease with which the craft is handled while under sail, great care must be exercised to get the best possible results. To place the center of effort a few inches too far in advance of the center of the hull resistance would cause a bad "weather helm"; this could only be remedied by moving the entire rig farther aft, which would necessitate a considerable expenditure on the part of the owner. The pressure of wind upon a sail in a wholesail breeze is about one pound per square foot of sail area, but this is of little practical value.

It is most interesting to watch the launching of a yacht, and to notice how she rests at a certain water line many feet above her keel. To the novice, this means but little; but the necessary calculation to make this vessel float at a desired length with restricted draft and beam means a great deal to the naval architect. It means that to get this result (which can be figured to a fraction of an inch), all weights which go to form a part of the construction, the rigging, sails, interior fittings, in fact everything even to the paint which covers the planking, must be carefully estimated, so that their combined weights will not exceed the displacement of the hull, at a specified load water line length of draft. To estimate the displacement of a yacht at a certain water line, the underwater body is divided into equally distant sections, the area of each is then found, multiplied by the distance, then multiplied by sixty-five, being the weight of one cubic foot for salt water. The

center of buoyancy and center of gravity of the hull must be in the same vertical line to insure good results.

The use of the integrator and planimeter for finding areas, centers of gravity, buoyancy, resistance, displacement and stability, reduces to a minimum the work and gives more accurate results than the former method of calculation by use of construction lines and mechanical balance. In the present era, when naval architecture is taking such tremendous strides, new methods of calculation are made necessary, new models must be used in the experiment tank, new means of propulsion must be introduced, and the initiative of the architects must be taxed to its utmost to keep pace with the times. The results obtained by experiment, combined with a technical and practical knowledge of the art, which today are producing our successful pleasure yachts will undoubtedly in the near future react beneficially on commerce, through their application to our merchant marine.

News From The Companies

DALLAS.

Mr. P. P. Thomas, assistant treasurer, and Mr. L. A. Bowers, auditor, intend visiting the Boston office in October, and from there to attend the Convention of the American Street and Interurban Railway Association, held at Atlantic City.

Mr. W. W. Loomis, who has been connected with the Dallas Companies as purchasing agent, has just returned from a vacation spent in New England, during which he made a flying visit to the Boston office.

BROCKTON.

Brockton was recently visited by a gang of wire thieves, and as a result of this visit the Brockton Edison Company was relieved of approximately 3,000 feet of No. 6 triple braid, copper wire, which formed part of the municipal incandescent circuit.

Upon investigation we found that a ladder was used in reaching the top of the pole, that the wire was then cut free from the insulators, and that on coming to a street fixture the wire was cut on both sides of the pole, leaving the loop to the lamp intact. The police were immediately notified, but no trace of the gang could be found. The neighboring town of Braintree was also visited and a quantity of wire stolen in the same manner. This is undoubtedly the same gang which has lately been operating in and around Boston.

The high tension line between Brockton and Stoughton is completed, and current is now furnished the Stoughton Gas and Electric Company from the Brockton station.

Work is progressing smoothly on the erection of our new power plant in East Bridgewater, and our new underground system in Brockton is rapidly nearing completion.

HOUGHTON, MICH.

There are several places in our roadbed where considerable trouble is experienced in surfacing and maintaining our track in good condition, owing to the large amount of clay that is in the soil. To overcome this we have recently started to fill these sections, to a depth of four inches, with stamp sand taken from one of the copper mines, and have found that this makes an ideal ballast.

Stamp sand is composed of copper bearing rock out of which most of the copper has been extracted by crushing and washing, leaving a pure mineral sand free of any clay or vegetable matter. This sand not only serves for surfacing, but, compared with parts of the roadbed where the sand is not used, it renders the operation of the cars almost noiseless. It also does not permit the growth of weeds or grass, which at present adds quite an item to our yearly expense.

We are particularly fortunate in having a large amount of this sand available at a point close to our lines, and already we have over two miles of track surfaced. We hope to finish at least two miles more this fall, and trust that next spring we shall not have as much trouble as in past years when the frost starts to come out of the ground, causing our track to heave considerably. This heaving is very costly, as it racks the cars, tears down the overhead line, and often interferes with our schedules.

We are undoubtedly the only electric line in the United States that has this particular kind of sand available, this of course being due to the copper mining territory in which we operate. While this information may prove of interest to our traction neighbors, it will be of little value because of their inability to secure stampsand.

(G. A. Richardson.)

The construction work at the Houghton station of the Electric Light Company is progressing most satisfactorily. The new 1000 K. W. Curtis turbine has been put in place, and the installing of the auxiliaries and piping is about to be commenced. The steel and concrete floor for the high tension transformer and switchroom, under the switchboard gallery, has been completed, and the 11,000 volt solenoid operated oil switches are now being installed. It is hoped to have the new apparatus in operation early in November. Much credit is due Construction Superintendent Ralph and Electrical Engineer Carter of the Stone & Webster Engineering

Corporation for the manner in which the work is being carried on, as it has been unnecessary to interrupt the station operation in any way.

A fifty horse power induction motor has been installed in the Pryor lumber mill in Houghton through the efforts of the contract department.

The railway reports a most prosperous summer, the traffic being the heaviest in the history of the road—1,029,323 passengers were carried during the months of July and August.

Electric Park continues to meet with popular favor, the free dances being especially well attended. During the month of August there were 18,598 visitors at the Park, and during the first two weeks of September, although a greater part of the time was cold and rainy, the attendance amounted to 5342. The Sunday band concerts have been discontinued for the season.

The management is contemplating giving dancing and snowshoeing parties and other amusements at the Park during the winter.

A daughter was born to Mr. and Mrs. McGrath on August 25. Mr. Hovey made us a visit of a few days early in September.

A large portion of the business and residential section of the village of Hubbell was destroyed by fire the latter part of August. The fire, which ruined property to the value of about \$100,000, is supposed to have been of incendiary origin. Rubbell has a population of some 1500, and is served by both the railway and lighting companies, being the terminus of the Lake Division of the street railway.

The Calumet and Hecla mining company are installing a new 1000 Kw. generator in their plant at Lake Linden. With this machine the total capacity of the plant will be 8000 Kw.

The street railway service is still being discommoded by the work of paving Quincy Street, Hancock. The work has not yet been completed, owing to the difficulty of obtaining sufficient labor.

The telephone company has not complied with the ordinance of the city of Hancock ordering all poles and wires to be removed from Quincy street by August 1st. At the last meeting of the city council the street commissioner was authorized to remove the poles unless the company started the work within three days.

Mr. F. O. Mayotte, claim agent of the street Railway, has recently returned from a vacation trip to southern Michigan.

The village of Laurium has finally decided not to pave any of

its streets this year. The railway has been confronted for some time with the prospect of paving work being started in Laurium.

Mr. McGrath left on September 15 on a visit to the Boston Office.

Mr. Whitney of the securities department has been a business visitor in Houghton for several days.

- Mr. J. H. DuFresne, assistant treasurer of the Copper Country companies, is to attend the meeting of the assistant treasurers in Boston in October.
- Mr. G. A. Richardson leaves for Boston on a vacation trip on October 10. He expects to attend the street railway convention at Atlantic City before his return.

The lake passenger steamers of the lines plying between Buffalo and Duluth, all of which make Houghton, have made their last schedule trip for this season. The companies report exceptionally heavy traffic for the past summer.

It is stated that according to a recent census the population of Calumet amounts to 55,000 souls.

The fifth annual Copper Country Fair opened its doors the latter part of September. This fair is essentially a county fair. While Copperdom does not claim to be an agricultural territory, yet one would be surprised to see to what size and excellence the fruit and vegetables grow in this section of the world. The electric light company in the last two years has taken the first and the second prizes awarded for the most attractive booths. Last year the company was not striving for a prize, and less endeavor will be made this year to carry off any of the honors. An exhibit wherein heating, cooking and lighting by electricity can be practically demonstrated is what is most desired.

A preliminary survey has recently been made by the engineering department for a proposed extension of the street railway from Wolverine to Mohawk, a distance of 4.6 miles.

PONCE, PORTO RICO.

A question frequently asked of those who have joined the foreign colony in Porto Rico is, "How do you amuse yourself and what are your sports?" The list of these is not a large one, even when to those that are foreign in character are added those of native origin. Naturally, the harbor of Ponce is an inviting field for aquatic pleasures, and boating is fairly popular, though but two boats have permanent moorings in the bay. These are

Swampscott dories with jib and mainsail. An Englishman is the owner of a native built sloop about 22 feet long, and a fine little knockabout, belonging to a Porto Rican, completes the Ponce fleet. The last named boat, however, is not always to be found in the harbor, for ordinarily it is moored farther east adjacent to a plantation of its owner. The remainder of the harbor craft is used principally for fishing, freight or ferry work between the steamers and the land.

A very attractive trip is that to the Caja de Muertos, an island about twelve miles from Ponce. The name in Spanish means "Dead Man's Chest," and, as the name would indicate, the island at one time formed the location for concealment of treasure by some freebooter or buccaneer. Unfortunately, the winds are unfavorable for this trip unless the start is made in the small hours of the morning, and this fact probably accounts for the limited number who are tempted to make the journey.

Bicycling is very popular among the working people here but is never indulged in by others. Probably they think it too fatiguing. The place that this sport used to hold in the States is here held by horseback riding, which is a favorite of young and old. The native horse is rather smaller than the average in the States, but has great endurance and a gait, called the single-foot, which is so smooth that even a novice can ride many miles without fatigue.

In ten minutes' time one can ride out of the city into an almost unsettled country, or into the heart of a large plantation where nothing indicates the proximity to a city. On the mountain trails which lead up into the hills from the outskirts of the city one often meets pack trains, heavily laden with coffee and fruits for the city market or with articles bought in the city and destined for some remote plantation or settlement that cannot be reached by any wagon road. By moonlight these trails are attractive beyond belief, in spite of the fact that in many places a misstep would throw both horse and rider over a precipitous slope into the river bed two or three hundred feet below.

Automobiles are rapidly coming to the front as a source of amusement as well as for commercial purposes, and excessive speeds are the rule, despite which but few accidents have thus far occurred. The trip between Ponce and San Juan, a distance of approximately eighty-five miles, by the regular passenger auto is very attractive. The car, which holds eight besides the driver,

flies along the level stretches and climbs the hills remarkably well. Some inclines are so long and so crooked, as the road doubles back and forth in ascending the side of the mountain range, that it seems as if the car could not possibly reach the top; but some of them do it without use of the low gear. The descent is hairraising to one who does not personally know the skill of the drivers. for they cut the corners so close that the rear wheels pass within a few inches of the bound stones, which are all that stand between the road and a drop of several hundred feet. But after watching all the curves for a mile or so one notices that there is practically the same clearance every time, so that the fear of a smash gives way to a feeling of admiration for the eyes and nerves that can guide a car so nicely over an eighty-five mile course and do it five times a week, often using less than six hours, including all stops for passengers and one of thirty minutes in Aibonito or Cayey for lunch.

Tennis is slightly indulged in here in Ponce, and baseball is moderately popular. Both games are more common in San Juan.

The theatre offers a few attractions, including Italian opera, Spanish Zarzuelas, and the Cinematograph. One or two American companies have played here, but their musical numbers were coldly received. The Porto Ricans are a very musical race and will not accept the type of song so dear to the summer crowds in Boston and New York.

Dances (bailes) are the real attraction for society, and the dance called the Danza is the favorite. The music for this is very attractive and can be used as a two-step. The time is syncopated to such an extent that the pieces are hard to play; but when well executed by a Porto Rican orchestra, it is hard for a lover of dancing to keep still.

Fvery Sunday night the firemen's band (Banda de Bomberos) gives a concert in La Plaza, or public square, in the city, and all the young people gather to listen. This square is paved with cement, and chairs are rented for those who wish to sit down; but great numbers parade around and around, the young ladies often accompanied by young men, but usually in groups of three or four. Best gowns are the rule, although now and then a barefooted peon will be seen on the outskirts of the crowd.

On Monday night the Banda Marina gives a concert on the waterfront, and on Thursday night another in the children's playground. These latter concerts are, if possible, more popular than the Sunday night ones, for this band plays more stirring and martial airs, whereas the Banda de Bomberos plays more Spanish concert pieces. Moreover the playground, called Plaza Abolition, is set out with trees and grass cut by cement walks, instead of being one broad expanse of pavement. It is therefore a more attractive spot in which to stroll. Swings are provided for the young people, and the boys have a circle swing that gives them great delight.

These then are the main attractions. Cards and billiards are often indulged in, but there is only one pool table and one bowling alley in Ponce, and both are private property.

There is no street railway park in Ponce, but San Juan has a very attractive one on the shore, under a big cocoanut grove. This draws large crowds every day and evening. Ponce needs something of the kind, but no suitable place has yet been found within a reasonable distance of the present system. The only good cocoanut grove is too far to the westward, along the beach where the soil is not very firm. However, the open cars of the street railway afford a ride to the water side, which is greatly enjoyed on the warm evenings; and it is to be hoped that in the near future with improvements at the Playa or port, amusement facilities will be established which, on the score both of pleasure and of health, will contribute largely to the attractiveness of our Porto Rican city. The pleasure-loving people of the island take kindly to affairs of this sort, and perhaps in connection with the construction of a wharf at the Playa, a franchise for which has recently been granted, the question of an amusement resort may be considered and provided for.

EL PASO.

A very remarkable accident and even more remarkable escape from instant death occurred in El Paso on August 25. A certain Miss Simmons was out riding when her horse became unmanageable and ran away. The frightened animal dashed head-on into a 20-ton semi-convertible car. The horse was killed instantly, the dash board bent in and the controller and air brake control were both dismantled. Miss Simmons was precipitated through the front vestibule and past the motorman through the front door into the car and escaped with only a scratch.

During the latter part of August and the first part of September, the El Paso Electric Railway Company has perfected a change in its boiler room in order to burn coal instead of oil.

The experiment has been tried of burning pea and slack coal with forced draft with very gratifying results. This coal is almost a drug on the market and can be laid down in El Paso at \$2.50 a ton, as against a price of \$4.60 per ton for a medium grade of run-of-mine coal. The price paid by the company for oil prior to the new arrangements was \$1.63 a barrel f. o. b. El Paso, so that the change in question will effect a very large saving in operating expenses.

A franchise was granted by the county commissioners of El Paso county on August 31, 1907, to Mr. J. W. Gibbs for the construction of an interurban line between El Paso and the town of San Elzario, about 26 miles from El Paso down the Rio Grande valley. The initial plan is to build a line from the city limits of El Paso to the town of Ysleta, a distance of about nine and one-half miles. The country between El Paso and Ysleta is well irrigated and it is intended to use this line for bringing garden truck into El Paso as well as for passenger service. Ysleta is the oldest town in the United States and now has a population of about 2500.

During the month of September, Mr. John J. Mullen and Mr. Maurice H. Pease have joined the force of this company from the Boston office.

Mr. H. T. Edgar, formerly manager of the El Paso Electric Railway Company and now manager of the Northern Texas Traction Company, visited El Paso during the week of September 7th to 13th and among other things made temporary arrangements for the next convention of the Southwestern Electrical and Gas Association, which is to be held in El Paso early in May, 1908. Mr. Edgar expressed himself as being very well pleased with the facilities which El Paso affords for holding a convention of this kind.

The new street paving in paving district No. 1 of the city of El Paso has turned out to be such a tremendous improvement to the city that there is great activity at the present time in connection with the extension of the paving to other streets. The pavement used heretofore has been the Bitulithic, which is also the kind of pavement to be used in the extensions now planned. The new work now under consideration comprises about three miles of streets and the track work in connection with this paving, together with its share in the paving, will cost the El Paso Electric Railway Company about \$75,000.

In the first paving district, the street railway work consisted

of 9 inch, 90 pound grooved rail set in a concrete sub-base 12 inches in depth and 8 feet wide, the top of the concrete base being flush with the top of the ties. The track construction for the proposed paving extensions will consist of 7 inch, 70 pound tee rail and the concrete will be brought up between the rails within 2 inches of the pavement surface. With the grooved rail the Bitulithic pavement was brought up flush with the side of the rail both inside and out, but in the new construction vitrified brick liners will be placed along the inside and outside of the rail, three rows of liners being used for this purpose.

The recent state law of the State of Texas requiring the closing of saloons on Sunday has proved a boon to the El Paso Electric Railway Company by requiring all the thirsty ones, who are numerous in El Paso, to take the cars over to Juarez in order to get a drink. This resulted on September 15, 1907, in the company beating its largest previous record of daily earnings by a very tidy margin. A total of 40,673 people were carried on our cars on that date and the gross earnings, including the bridges, were about \$1,520.

The El Paso Electric Railway Company is installing a 520 H. P. Aultman & Taylor boiler in place of three of their old tubular boilers, and are rearranging the rest of the old boilers to burn coal instead of oil. The expiration of the existing oil contracts placed a time limit on the completion of these boiler changes, and delays in the delivery of the new boiler necessitated getting it into operation at the earliest possible moment.

The erection of the boiler itself was taken care of by the Aultman & Taylor people and was done in good time. The setting, which is of the usual type for a half battery and involves a total of about 32,500 brick, was erected by Mr. J. A. McCampbell, construction superintendent for the Stone & Webster Engineering Corporation, in the remarkably short time of 36 hours. This probably establishes a record for this kind of work.

SEATTLE.

The Seattle climate was once described by a cynic as made up of two seasons, the rainy season and the month of August. This is frequently quoted in Seattle in a joking way, but it is a base slander of Seattle's climate, as everyone that has been here any time admits that Seattle has one of the finest climates in the

country. This year the cynic's saying was not at all borne out, as the month of August was unusually cool, cloudy and showery. This weather kept us from showing as large an increase in railway receipts as we had for some months previous. Ringling Bros.' circus showed here two days to immense crowds, which helped our railway receipts decidedly. The circus was partly located on the company's unoccupied property adjacent to the North Seattle car house and sub-station.

Our new reinforced concrete North Seattle car house was put into service early in September. It has a capacity of forty-eight large cars and has helped greatly in providing adequate car storage room. On account of a regrade project which will raise the street in front of this car house about twelve feet it was necessary to support the building on columns and build an approach to it from the street on a trestle.

The 1000 Kw. railway motor generator set for the North Seattle sub-station has arrived and is now being installed. The two 500 Kw. 250 volt motor generator sets for the new Edison sub-station at Western and Union have also arrived and are being installed. It now seems probable that the operation of both these substations will be started about the middle of October. They are both badly needed to help take care of our increasing load.

At the new Georgetown power house the 3000 Kw. turbine burned out a third time and has been repaired. The General Electric Co. is sending out temporary boosting transformers to run with this machine and is building a new generator and shaft, which will take four or five months to complete. The 8000 Kw. turbine was shipped September 6th and passed Billings, Mont., Sept. 18th. This machine will be needed during the coming winter to help carry our load and also to relay the Electron water power plant. The reinforced concrete stack is growing, about two-thirds of the height being completed on Sept. 19th.

At the new Georgetown shops work has been progressing on getting ready to move into the new buildings. Some of our stock has been moved into the new store room and the bulk of this moving will be carried on in connection with the moving of the shops.

Two trials have been made running our new trail cars. These could not be operated before on account of not being provided with proper draw bars. It is too early to say yet how successful the operation of these cars will be. The principal chance of difficulty seems to be with the weight of the cars, which are rather heavy

for trailers. They are practically the same as our motor cars with the exception of the electric equipment, and can be very easily changed to motor cars.

The extension of the Wallingford Ave. line to connect with the old University line, about a mile of double track, was put into service September 10th. This will furnish cross-town transportation from Fremont to the University, to and from the new Lincoln High School, and will help out the service on the old University line during the Eastlake Ave. regrade.

The extension of the Cedar Street line to the top of Queen Anne Hill was completed and put into operation September 18th. This will furnish transportation to a large district on the top of Queen Anne Hill, and will be called the North Queen Anne line. It will be of very material assistance in helping out the service on the Queen Anne Counterweight System.

Mr. H. F. Grant, the district manager for the Puget Sound district, left here for Boston on September 6th, intending to be away about three weeks.

A Philadelphia banker was in the city a few days ago. He said, "You must have exceedingly cold weather here in the winter." When he was told that last winter the coldest weather was 12 degrees above zero, which was the coldest weather on record for fifteen years, he was very much surprised. This is related to correct similar incorrect ideas in the minds of people who may read this magazine.

FORT WORTH.

Mr. R. Kelly has resigned as inspector on the Fort Worth Division and Mr. W. L. Coleman has been appointed in his place. Mr. Coleman has been in the service of the company as a conductor for a great many years and his promotion to the position of inspector comes as a reward for faithful service to the company.

Mr. A. W. Q. Birtwell, assistant treasurer, accompanied by Mrs. Birtwell, left here Friday, September 20, for Boston for the purpose of enjoying a few weeks' vacation and also attending the Street Railway Association meeting at Atlantic City and the Assistant Treasurers' meeting in Boston.

The coal bins at the Handley Power House, which were designed by the Engineering Corporation and constructed under the supervision of Mr. George B. Kilmer, have finally been completed and are in operation.

Arrangements are being made to drill another well at the Handley Power House; this well to be a nine inch casing and to be about five hundred (500) feet deep.

Contracts have been let for the installation of a 1000 Kw. unit at the Handley power house, together with the necessary additional boilers, condensing apparatus, pumps, etc. It is hoped to have this apparatus in operation by March 1, 1908.

Great preparations are now being made in Fort Worth for the Fort Worth Fair which will be held at the Fair Park, from October 8 to October 17, 1907. This is the first large fair that has been held in Fort Worth and large crowds are expected.

Two days after the closing of the Fort Worth Fair, the Great State Fair at Dallas opens, running through the balance of the month of October and for a few days in November. It is expected that these two events will be the means of very heavy travel on the Interurban, and we are looking for the largest business in the history of the company during the month of October.

The portable sub-station which has been under construction for some months for use on the Interurban, is now in operation. This sub-station consists of a box car containing a 400 Kw. rotary converter with the necessary transformers, switch-board, etc. It is located at Siding 18, half way between Fort Worth and Dallas. The distance between the main power house and sub-station No. 1 near Dallas is twenty (20) miles and the voltage on the line about half way over has always been very low. Since the portable sub-station has been in operation, the voltage over the entire system is very nearly even, with the result that it is very much easier to make time with the cars than heretofore. The motormen on the Interurban are particularly well pleased with the improvement as it is a very great help to them to have good voltage over the entire line. It also makes travelling at night very much pleasanter, as before the sub-station was started, the lights in the cars were so bad that a person could not see to read.

(H. T. Edgar.)

MINNEAPOLIS

It has occurred to me that a few facts concerning the city of Minneapolis, wherein is located The Minneapolis General Electric Company, the largest electric lighting company managed by Stone & Webster, might be of some interest to the readers of the Public Service Journal.

The first settlement of the present city of Minneapolis was made on the east bank of the Mississippi river at St. Anthony Falls about 60 years ago. The east side settlement was called "St. Anthony." Shortly after, a new settlement was made on the west bank of the Mississippi and called "Minneapolis." The two towns continued separate until 1872, when they were incorporated under the name of "Minneapolis." Since the latter date, the city has had a rapid but steady growth; the population at the present time being placed at 302,000, as a conservative estimate.

Minneapolis is the largest city in the United States without water transportation of any kind, but its immense commerce with the outside world is well taken care of by its excellent railroad facilities. Eight first-class railroads connect the city with the East. Three huge trans-continental railroad systems connect the city with the West, and a fourth is now under construction.

The territory which Minneapolis jobbing and manufacturing interests serve is bounded on the west only by the Pacific Ocean, and in exchange it receives from this vast Northwest its wheat, grain and lumber. The business of the city, therefore, both present and future, seems to rest on a foundation so solid that nothing can destroy it.

In addition to being the leading city of the Northwest, Minneapolis leads the world at present as:

A primary wheat market: the wheat receipts alone aggregating 90,000,000 bushels a year.

A flour center: the number of barrels manufactured last year being 13,825,795.

A lumber distributing center: the city being the receiving and shipping point for vast quantities of lumber manufactured elsewhere, while its own mills have a yearly capacity of 750,000,000 feet.

While the price of steam coal is necessarily high as compared with sea and lake ports, the city enjoys the advantage of water-power from two sources. The Falls of St. Anthony at present develop 40,000 horse power, with a further development of 10,000 horse power now under construction, which power is used principally by the flour mills; and there is the 25,000 horse power plant of The Minneapolis General Electric Company, situated 45 miles from the city at Taylors Falls, which power is now being distributed throughout the city for general manufacturing purposes.

Minneapolis is not yet in the Pittsburg or Chicago class as regards size or amount of business done, but it can consistently claim to be in the front rank of the cities of the United States as a pleasant place to live.

With the exception of the Lake Minnetonka region in the summertime, there are no suburbs: everybody lives in Minneapolis, either within comfortable walking distance of the business district, or a short ride on the street cars, which are first-class both as to equipment and service. The streets are wide, well kept and well shaded, and the parks, lakes and boulevards within the city limits, including Minnehaha Falls, made famous by Longfellow, are all noted for their beauty. Within a few hours ride from the city are countless lakes and a number of rivers, with excellent fishing and wild-fowl shooting in season.

The educational advantages possessed by Minneapolis are exceptional. Within the city are located 59 graded and 5 high schools, while the University of Minnesota ranks as one of the leading universities of the country; its enrollment last year being nearly 4,000.

Lastly: come to Minneapolis and escape dying—the death rate for the year 1906 being but 8.47 per thousand, the lowest of any large city in the United States.

J. A. SARGENT.

CHASE-SHAWMUT COMPANY

J. F. Crocker, Jr., has been with us for a month, "filling in" in our accounting department during the vacation period.

Richard H. Harris has just joined our organization in the accounting department.

MASSACHUSETTS.

At the last session of the Massachusetts Legislature, a statute was enacted called "An Act to Provide for One Day's Rest in Seven." The following Bulletin, issued by the Brockton & Plymouth Street Railway Company, gives the law in full:—

BROCKTON & PLYMOUTH STREET RAILWAY COMPANY To All Officials and Employes Concerned.

The attention of all officials and employes is directed to a statute which was enacted during the past session of the Legislature, being Chapter 577, Acts of 1907, which is as follows:

"CHAPTER 577.

AN ACT TO PROVIDE FOR ONE DAY'S REST IN SEVEN. "Be it enacted, etc., as follows:

"Section 1. Except in cases of emergency or except at the request of the empolye, it shall not be lawful for any person, partnership, association or corporation to require an employe engaged in any commercial occupation, or in work of any industrial process, or in the work of transportation or communication, to do on the Lord's day the usual work of his occupation, unless such employe is allowed during the six days next ensuing twenty-four consecutive hours without labor.

"Section 2. This act shall not be construed as authorizing any work on the Lord's day not now authorized by law; nor as applying to farm or personal service, to druggists, to watchmen, to superintendents or managers, to janitors, or to persons engaged in the transportation, sale or delivery of milk, food or newspapers.

"Section 3. Whoever violates the provisions of this act shall be punished by a fine of not more than fifty dollars for each offence.

"Section 4. This act shall take effect on the first day of October in the year nineteen hundred and seven. (Approved June 28, 1907.)"

It will be readily apparent to each and every employe that he can be assigned to work only on six days of each week unless he expresses to the company his request to be assigned to work on seven days.

Cards will soon be supplied upon which it will be necessary for each employe to express his preference. In the meantime please indicate your preference verbally to the Despatcher in order that he may arrange to keep such additional forces as may be necessary.

Employes in departments requiring daily service are requested to note that the rest day will not come on Sunday.

Two cards were supplied by the company, one to be signed by employes desiring only six days work per week and one to be signed by employes desiring seven days work per week.

These cards read as follows:

Brockton & Plymouth St. Ry. Co., Plymouth, Mass.

190

Sirs:

Referring to Chapter 577, Acts of 1907, it is my wish to work but six days in seven until further notice.

Brockton & Plymouth St. Ry. Co., Plymouth, Mass.

190

Sirs:

Under the provisions of Chapter 577, Acts of 1907, I hereby request that I be given seven days work each week until further notice.

Complete returns are now in hand and it is found that 48 employes have requested 7 days work per week, 3 have requested 6 days work per week, and 11 shop extras have not signed as yet.

Similar bulletins and cards were issued on The Blue Hill Street Railway with like results. On that road there are now 73 employes. Sixty-one have requested 7 days work per week, 1 has requested 6 days work per week and 11 shop extras have not signed as yet.

It is fair to assume that other railway companies are finding a similar disposition among their men, and it is quite evident that the men themselves desire seven days work and seven days pay per week as a steady diet, with an occasional holiday of one or more days when the inclination seizes them.

QUOTATIONS

ON

SECURITIES OF PUBLIC SERVICE CORPORATIONS

UNDER THE MANAGEMENT OF

STONE & WEBSTER

OCTOBER 1, 1907

NOTE:—Quotations are approximate. Unless indicated to the contrary Bonds and Notes are 5 per cent and preferred stocks 6 per cent non-cumulative. Bonds are sold plus accrued interest.

COMPANY		BONDS	PREF.	OOM.
Blue Hill Street Railway Co., The		100	No pref.	
Brockton & Plymouth St. Ry. Co.		100	No pref.	••••
Cape Breton Electric Co., Ltd.		88	80	15
Columbus Electric Co.		94	••••	• • • •
Columbus Power Co., The	Notes	96 95	2	16
Dallas Electric Corporation	14	90	60	20
Edison Elec. III. Co. of Brockton	Notes	100 100	No pref.	120
El Paso Electric Co.	12	921/2	90	473/2
Fall River Gas Works Co.		No bonds	No pref.	280
Galveston Electric Co.	-	921/2	88	821/2
Galveston-Houston Elec. Co,		••••	88	821/2
Houghton County Elec. Lt. Co.		95	221/2 8	15
Houghton County St. Ry. Co., The		90	95	25
Houston Electric Co.	9	95	88	321/2
Jacksonville Electric Co.		921/2	95	90
Key West Electric Co., The		••••	9	• • • •

COMPANY	BONDS	PREF.	oom.
Lowell Elec. Lt. Corporation, The	100	No pref.	185
Minneapolis General Elec. Co., The	100	103	95
Northern Texas Electric Co.	941/23	80 11	3 4
Paducah Traction & Lt. Co.	90	60 4. 5. 6.	18
Pensacola Electric Co.	98	85	26
Ponce Electric Co.	100	No pref.	••••
Puget Sound Electric Railway	97½ 94¾	88	50
Puget Sound Power Co.	102	No pref.	15
Savannah Electric Co.	98	80	121/2
Seattle Electric Co., The 1st m'tge Comeol. and Refund m'tge convertible " " " non-cen. Notes	98 92½	95 ¹⁸	80
Tacoma Railway & Power Co.	98	No pref.	17
Tampa Electric Co.	No bonds	No pref.	120
Whatcom County Ry. & Lt. Co.	95	88	44

^{1.—}Cumulative. 2.—No dividend yet paid. 3.—Bonds of Northern Texas Traction Co. 4.—5 per cent. 5.—Cumulative after Dec. 1, '07. 6.—1 per cent paid Dec. 1, '06 and June 1, '07. 7.—6 per cent. 8.—Par \$25. 9.—Listed Boston and Louisville. 10.—Listed Boston. 11.—Listed Louisville. 12.—Listed Columbus, Ohio. 13.—Listed Boston, Columbus Ohio, Louisville. 14.—Listed Louisville, Columbus Ohio. 15.—Held by Seattle Electric Co. 16.—Held largely by Columbus Elec Co. 17.—Held by Puget Sound Elec. Ry. 18.—4% per cent.

STONE & WEBSTER

Securities Department

OFFICES:

Boston - - - 84 State Street Chicago, 604 First National Bank Bldg.

NOTE. — The Securities Department handles securities for those wishing to purchase or sell, keeps accurate quotations, and gives out information about above companies.

Miscellaneous Notes

COUPONS AND DIVIDENDS DUE

LIBRARY OF STONE & WEBSTER

Current Literature

Selections from the September Magazines and Book Accessions.

We print below some of the more important recent references. Ed, (r), *, and + are used to indicate editorial, review, illustration, and map or diagram, respectively.

Bridges and Construction.

1 The proportioning of steel ry bridge members. Safe working stresses; provision for possible increase in live loads, etc. HSPrichard, ASCE. +301-2.8p-Engrg News-9|19|07

The fall of the Quebec cantilever bridge. *+258-6.6p, Ed 256-1.7p-Engrg News-9|5|07

The Quebec bridge disaster. *+329-7p-Engineering-9|6|07
The Quebec bridge failure; our deficient knowledge of the strength of large columns. *+287-4.2p, Ed 284-1.8p, 286-0.9p-Engrg News-9|12|07

The design & constru of industrial bldgs. DCNCollins. *+906-25p-Engrg Mag-9|07

Concrete.

6 Faults of reinforced concrete design & constrn. HFPorter. 94-2p-Concrete Engrg-9|1|07

Tests of the adhesion of steel to concrete in beams: experimental data; high values for shears & adhesion stresses. +169-1.8p-Fd 171-0.7c, Engrg Mag-8|15|07

The durability of reinforced concrete structures; conditions likely to affect the durability & precautions necessary. FEWentworth-Shields. 952-2p-Engrg Mag-9|07

Concrete column tests. ANTalbot, ASTM. *+146-9.3p-Cement Age-9|07

Generators, Stations, Hydro-electric Plants, etc. (See also 37-89)

10 The trend of storage battery develomt. LHFlanders. 520-8p-Elec. Journ-9107

11 Notation for polyphase circuits. CHPorter. Clock-face diagrams. 497-8.7p, Ed 484-0.7p-Elec Journ-9|07

12 Synchronous motors for improving pr-factor. WNesbit. Ed 421-1.5p, +425-9p-Elec Journ-8|07 13 Cos Cob (Conn) pr station, NYNH & HRR Bldg; turbo generators;

condensers; boilers; economizers; coal handling, etc. *+407-5.3p-Electl World, *+308-8.5p, Ed 306-0.5p-St Ry Journ-8|31|07 14 The hydro-el develomt of Gt Northern Pr Co on St Louis River

near Duluth, Minn. Part I. Water pr available; reservoir; forebay; ice conditions; pipe lines, etc. *+250-4.1p-Engrg Record-9|7|07 *+250-4.1p-Engrg 15 Part II. Station bldg; transformers; wiring scheme; transmen

lines; market for pr; methods used in constrn. *+287-4.9p-Engrg Record-9-14-07

16 The 50,000-volt line of Taylor's Falls-Minneapolis pr transman.

Pole line; insulators & pins; ltnng protection. *+443-3.7p-Elect'l World-9|7|07

Lighting.

17 Lighting. A collection of papers covering the entire field of electrical illumination. Electrical Review, 9|14|07-50p

Steam Engineering. (See also 29)

- 18 Indicator practice. Types of indicators & reducing gears. Methods of taking diagrams. ACScott. *+879-5.3p-Engineer-9|16|07
- Boiler-room design & equipment. WHBryan. *448-13p-Cassier's Mag-9|07

Railway Affairs. (See also 32-34)

- El locos Abs HLKirker. Computation of draw-bar puil & horse pr required. 327-2.3p-EA-8|07
- Rail sections & specifications. Progress Rep of com ASCE in full. 250-3.6p-Ry Gaz-9|6|07
- The Visalia El Ry, Cal, between Visalia & Lemon Cove; 15 cycle single-phase. Gen details of constrn & rolling stock. AHHalloran. *+169-4.6p-Journ of Elec Power & Gas-8|31|07

Municipal Ownership. (See also 31)

- 23 Mun gas and el ltg in the U S: analysis of present conditions & statistics—relative growth of private & mun plts; bibliography of mun own. 213-4p-8|21|07, +237-3.5p-Municipal Journ and Ensineer-8|28|07
- 24 Pub own news from Alameda, Cal; Hamilton, O; Danville, Va; Ranier, Ore; Wrentham, Mass. RalphAlbertson. 191-2.8p-Arena-
- Index of mun own failures treated in "Public Service." 87-1p-Public Service 9|07
- Rept of committee on investigation of public ownership to the Nat'l Civic Federation. Ed 153-0.5p, 182-3.3p-St Ry Journ-8|3|07; 77-6p-Municipal Engr-8|07

Book Accessions.

- 27 Easy mathematics of all kinds, chiefly arithmetic; Sir Oliver Lodge. 1906. 6x8, pp436. \$1.10. (1.03) *02.L82,1906
 - How to Write Clearly; rules & exercises on English composition. EAAbbott. 5x7, pp78 (gift). *Ab2,1875

 The steam engine & other ht motors. WHPCreighton. 1907. Illus. Diag. 6x9, pp499. \$3.75 (3.95). *072.C86,1907

 Handbook of the banks in Chicago; containing statemts of nat'l
- & state banks & financial statistics. Issued by Chicago Evg Post, 8|31|07. 4x6, pp60. 10c. *6900.B 22.025, 8|07
- The British city; the beginnings of democracy, mun conditions; pub utilities. FCHowe. 6x9, pp370. \$1.50. *03.H 83b,1907
 Offi proceds Pacific Coast Ry Club, San Francisco, 9|16|05. Evolu-
- tion & devipmnt of the stm locomotive. Illus. 6x9, pp105 to 190 (gift). *072.D 65.1905
- Poor's manual of rrs of the U S; fortieth an no. Maps. 1907. 6x9, pp1774. \$10. *6900.P79.022.1907
- Moody's manual of rrs & corpn securities. 1907. Maps. 6x9, pp2550. \$10. *6800.025.1907

147 Milk Street, Boston, Mass., September 80, 1907.

To All Employees of the Stone & Webster Management Association:

The Department of the firm of Stone & Webster which has heretofore been devoted to the management of companies, has been incorporated under the above name and will begin business October 1, 1907. All employees of Stone & Webster engaged in the work of management of public service corporations have been transferred to this Association.

The officers are as follows:-

BOARD OF DIRECTORS.

MR. RUSSELL ROBB, Chairman.

Mr. Charles A. Stone.	Mr. Frederick S. Pratt.
Mr. Edwin S. Webster.	Mr. Dwight P. Robinson.
Mr. Henry G. Bradlee.	Mr. Charles D. Wyman.
Mr. Charles F. Wallace.	Mr. Henry B. Sawyer.
Mr. G. E. Tripp.	Mr. Eliot Wadsworth.

MR. HENRY G. BRADLEE, President.

MR. C. D. WYMAN, Vice-President, In general charge of Railway Department.

MR. C. F. WALLACE, Vice-President, In general charge of Light and Power Department.

MR. F. S. PRATT, Vice-President, In general charge of Financial Department.

MR. G. E. TRIPP, Vice-President, In general charge of Organization and Public Policy. MR. HENRY B. SAWYER, Treasurer.

The division of districts under the authority of the gentlemen who are named above as Vice-Presidents remain the same as heretofore. All the departments of the Association and employees not attached to any district or to the Treasurer's Office will be responsible to and under the authority of Mr. G. E. Tripp.

We hope the transfer of employees from the firm of Stone & Webster to Stone & Webster Management Association will be approved and accepted by every one connected with the Association. We felt so sure that this would be the case that it was thought not necessary to consult each individual, and have proceeded upon the assumption that each one would accept in the Stone & Webster Management Association the position corresponding to that which he occupied with the firm of Stone & Webster. We are confident that this organization will be supported by the same loyal and efficient service that has made the firm of Stone & Webster successful. All the close personal relations that have existed between the individual members of the firm of Stone & Webster and each member of this organization will still exist and this Association is simply the outcome of the natural evolution of a business that has grown to large proportions.

HENRY G. BRADLEE.

President.

STONE & WEBSTER

84 STATE STREET, BOSTON

General Managers of

The Lowell Electric Light Corporation The Seattle Electric Company Puget Sound Electric Railway Columbus Electric Company Cape Breton Electric Company, Ltd. El Paso Electric Company Jacksonville Electric Company Ponce Electric Company Northern Texas Electric Company The Minneapolis General Electric Company Edison Electric Illuminating Co., of Brockton Houghton County Electric Light Company Brockton and Plymouth Street Railway Company The Houghton County Street Railway Company Whatcom County Railway and Light Company Savannah Electric Company Dallas Electric Corporation Paducah Traction and Light Company The Blue Hill Street Railway Company Fort Hill Chemical Company Tampa Electric Company Pensacola Electric Company The Key West Electric Company General Electro-Chemical Company Houston Electric Company Galveston Electric Company Fall River Gas Works Company Baton Rouge Electric & Gas Company Puget Sound International Railway & Power Co.

MR. WYMAN'S DEATH

The press has been stopped on this number of the Journal long enough for us to announce the death of Mr. Charles D. Wyman. The event was totally unexpected. On November 3 Mr. Wyman started from Boston on a business trip to Seattle, apparently in sound health. On Sunday, November 10, a telegram was received from Thompson Falls, Montana, stating that he had just been found dead in his berth on the train. No further details have yet reached us, but we assume that it was a case of heart failure.

No extended comment on this sad event will be expected at this time. That will come later. At the moment, the members of the Stone & Webster organization are conscious only that they have met with a great loss. Mr. Wyman was a man who won the respect and strong attachment of all who were thrown into personal contact with him. His was an invigorating personality, and its absence will be keenly felt.

STONE & WEBSTER PUBLIC SERVICE JOURNAL

DECEMBER, 1907

EDITORIAL COMMENT

Hereafter the Stone & Webster Public Service Journal will be issued on the first day of the month whose date it bears. It is necessary, therefore, that all copy should be in the editor's hands on the fifteenth of the month preceding in order to ensure immediate publication. General articles will of course be received at any time, subject to this provision. It is desired, however, that there may be no delay in the receipt of "News from the Companies."

The last number of the Stone & Webster Public Service Journal came from the press on the eve of the annual convention of the American Street and Interurban Railway Association and its allied associations. Extended allusion is made to the convention elsewhere in this number. We desire particularly to call attention to the article on page 393. There will be found there an account of some of the more interesting exhibits at the convention. The writer displays not a little skill in the treatment of his subjects: he certainly knows the meaning of multum in parvo.

In the "News from the Companies" this month is an item of general importance from Houghton, Mich. It is to the effect that the drop in the price of copper, resulting in reduction of output elsewhere, has caused hundreds of men to flock to Houghton County looking for employment. It is further stated that "unless conditions improve, the business of the community may be seriously handicapped." This was written when copper was at 13 cents, the condition of the metal being now, superficially at least, somewhat improved. On the whole, the news from Houghton County is in line with what many persons are expecting with reference to the entire industry of the nation, as a result of the complications in the money market.

. . .

There probably never has been a time when the industry of the nation has chafed so greatly because of money conditions as at present. The leaders of industry have great developments in mind which they are eager to effect without delay. The needs of the people seem imperatively to call for these improvements. Yet the money necessary for them is not forthcoming. The industry of the land is, in fact, beginning to feel like a giant who has suddenly had his arms pinioned. Eventually, it will be able to burst its chains; but when? To drop figures of speech, this is pre-eminently a period for conservatism in the commitment of capital. Commitment there must be in order to conserve what has already been accomplished, and unquestionably the banking interests will make every effort to provide for this particular need. But they will require the most rigid economies in the use of the money which they place at the disposal of the industrial world. Things that can wait will be obliged to wait; things that must be done will have to be done on the smallest amounts possible.

. . .

Mr. Blood's article on "How to Encourage Municipal Ownership" goes to the bottom of a very important question. We doubt if there is any demand for municipal ownership merely for the sake of municipal ownership. The American people are not doctrinaires. They have neither time nor inclination for fine political or economic fancies. They desire results, and they do not much care how they get them, provided they get them honestly. What they want in the way of public utilities is the best possible service at the fairest commercial price. Where there is a demand for municipal ownership, it springs from a belief that they are not getting that kind of service at that kind of price. Often, no

doubt, they are getting the best service at the fairest price which the actual conditions allow. But this is far from being always the case,—it was incontestibly not the case in the instance pointed out by Mr. Blood. Hence it is not strange that the dissatisfaction of the public should manifest itself in a cry for municipal ownership.

* * *

Undoubtedly many persons who raise this cry have no real eagerness for municipal ownership as a public policy. Probably on broad grounds they would be among the first to discourage such a policy. But the trouble is that the exigencies of every day life are apt to prevent great public questions from being settled on broad grounds. A man may suspect that in the long run municipal ownership will be a losing game for the community, but if it holds out the promise of better and cheaper service now and here that is enough for him—the remoter future may take care of itself. That is the way the wisest reason at times—perhaps most of the time. The day has passed for good when a public service corporation can treat the public any way it sees fit with impunity. The time has come when it must expect to be held to strict accountability, when it must give the community it serves full compensation for all it receives from it.

* * *

It is contended by some that competition is not the normal state of public utilities. It is asserted by not a few thoughtful persons that such utilities must, in order to accomplish their highest good, be monopolies. But as a matter of fact, there must always be the element of potential competition. Take the case of an electric lighting plant. If the company already in the field is giving the best service at the fairest commercial price of which the actual conditions admit, the monopoly exercised by that company is the best thing for the community. But if it is not giving the best service at the fairest price, then its monopoly is obviously a hardship. And yet if the community opens the field to compotition from private sources, it may very quickly find that it has made the situation worse rather than better. To threaten municipal competition is its last resort. This threat, in short, constitutes that element of potential competition to which the most strongly intrenched privately owned public service corporation is subject. Mr. Blood points out the means by which alone this element can be kept permanently inoperative.

"Waste" In Public Service Corporations

In this number is an article bearing on a subject most vital to the welfare of public service corporations. We refer to "Intelligent Action in Preventing Accidents" by Mr. W. W. Osborne, the eminent attorney of Savannah.

For years it has been an axiom that profit in business arises from "carefulness in details." Time was in this country when extravagance in operation did not preclude profit. But that time has gone never to return, as it must always go when a community gets beyond the pioneer stage. Twenty years ago nothing amazed the foreign visitor in this country so much as the waste in our mills and our public service corporations—such conditions would have meant the bankruptcy of foreign industrial enterprises. Two decades have marvellously changed things: competition has vastly increased; and even where it has not, there has been such a standardization of service rendered and rates obtained, that the effect is just the same. Every form of industry, and most of all the public service corporation, is forced to save both at the bung and the spigot.

Mr. Osborne points out that "a princely fortune" is annually wasted on damages growing out of accident claims. He places the amount paid in 1906 by the Stone & Webster street railway properties alone at \$513,600, and he adds that in some properties these charges show a tendency toward an annual increase. Briefly, these particular properties are paying out each year on accident claims a sum equal to 6 per cent. on \$8,560,000. Consider how great would be the benefit to the community if, instead of taking \$513,600 annually from earnings for accident damages, the managers of the Stone & Webster companies could apply this sum to dividends on \$8,560,000 of new capital for the development of the traction service of the United States!

Such enormous expenditures are an absurd necessity under existing conditions. But it is not conceivable that such conditions should be permanent. There must probably always be an irreducible minimum of damage expenditures, but that point is vastly below the current figures. To reach the proper level is one of the most serious tasks confronting public service corporations. And it is by no means a gigantic task.

Damage claims arise from two sources-fraud on the part of

claimants and negligence on the part of employes. A street rail-way company cannot control the morals of the public; it cannot, apparently, prevent unworthy individuals from pressing fraudulent claims against it. But in reality it can do just this thing, in no slight degree: on the one hand, it can so perfect its legal service as to make it a terror to evil doers; on the other, it can so perfect its operating service as to heighten immeasurably the difficulty of obtaining judgments at law.

Mr. Osborne declares, and properly, that the tremendous expenditure arising from the negligence of employes can and should be saved. His remedy is, in principle, of the simplest kind: he would have brought to bear on this problem "the same measure of intelligence and the same systematic effort employed to effect economies in other departments of the service." Intelligence and system!—like faith they can remove mountains.

The great desideratum is a more equal development of the activities of public service corporations. Intelligence and system have dominated the mechanical side to a wonderful extent. Swift has been the progress all along the line in devising means and in perfectly adapting those means to given ends. Engineering problems have had only to suggest themselves in order to arouse the intelligence and foster the systematic effort necessary to their solution. Had anything comparable to this taken place on the operating side, the street railways would today be vastly nearer the irreducible minimum of accident damages.

It is perhaps not surprising that progress has not been so fast in this connection. It is an instinct of the human mind to do one thing at a time. Then, too, the operating problem presents certain difficulties which greatly exceed any presented by the engineering problem. Chief among these difficulties is that growing out of the intractability of human nature—on the operating side we are dealing with men, not merely with things.

Still, the growth of the corporation has taught this generation one thing—namely, that it is necessary for the human mind to learn how to do a multiplicity of things at one and the same time, and to do them equally well. Furthermore, modern civilization has shown that men can be standardized as well as things. It is astonishing how exact the human mind can make its operations when it systematically employs itself to that end. The operating force of a street railway is capable of acting with all the delicate precision of a perfectly adjusted machine—not because its mem-

bers have become mere automata but because they have brought into exercise their higher faculties of thought and will.

The Three Factors In Public Utilities

The operative of a public service corporation is distinctly a middleman. The corporation is in the position of merchant, the public are in the position of customer, and the operative is the agent who brings the two together and consummates the deal. This is an important fact for each of the three parties to the transaction to remember.

The corporation should remember it, because by so doing it will be quick to adjust its dealings with the operative to the fairest and most considerate basis. And at the same time it will best conserve its relations with the public. The shortcomings of a corporation whose employes are contented and happy, and consequently good natured and effective, are much more easily overlooked than those of a corporation known to be hard and grasping with its help.

The public should remember it because by so doing it will be slow to subject the operative to the blame which belongs only to the corporation, or to circumstances over which neither the corporation, the public nor the operative has any control. Such circumstances are of the most common occurrence. Congestion of population is one of them. It is absolutely necessary, for example, that the travelling public co-operate with the street railway officials in order that the traffic be moved with any degree of satisfaction to anybody. It is imperative that the people wait patiently for the unloading of a full car, that they get on and off the car as rapidly as possible, that they do a great many other things to expedite the movement of the car. The conditions are of nobody's making in particular, and it is important that everybody should do his part to minimize them. And yet it is the commonest thing in the world for everybody to get more or less excited, and to look around for somebody to censure. It is generally the street railway operative who has to take the blow-he is the one who comes into immediate contact with the vexed public, and therefore he is the scapegoat.

The operative himself should remember it, because as agent it is clearly his duty not to imperil the relations which he is paid to advance. A merchant does not hire a salesman merely to measure

out goods and take in money. He engages him in order that he may display his wares as attractively as possible, thereby facilitating their cale. He hires, or thinks he does, intelligence and courtesy as well as mere mechanical handling of goods and money. Every salesman in a mercantile house understands that perfectly. Now the relations of a public service corporation (a street railway or a lighting plant) and the public are purely those of purchase and sale. The operative is simply a salesman, because on his manner of handing over the goods (transporting or lighting) depends in no small degree the size and profitability of his employer's business. If he is not prompt, courteous, effective, the patrons of the corporation will take away their business; or if they cannot do that-having no one else immediately at hand to whom to transfer it—they will harbor their resentment against the time when, politically or otherwise, they can vent it effectively and to the injury of the corporation.

NOTES ON THE MONEY SITUATION

By F. J. WHITING

The financial situation has occasioned great anxiety in the last month. It is unnecessary to recapitulate the facts; no one in the least interested in business affairs can be ignorant of them. What we are all trying to do new is to find out what those facts actually mean. It is not an easy task. The money market is such a wonderfully composite structure, the relations of its parts are so intricate and subtle, that the shrewdest mind must confess its ignorance in the face of the present situation. Still, it seems to me possible to make some progress in cutting one's way to the light. That at least is the purpose of these remarks.

I think it was in 1902 (possibly in 1901) that one of our greatest financiers declared that a great financial panic would never again be possible in this country. It is not perfectly clear just what he meant by that statement; presumably, his idea was that there could never be a recurrence of 1893, or 1873. At the time he made that statement a new phrase had come into vogue—"mobilization of finance." It signified that there had been effected a "community of interest" among those controlling the banking capital of the nation (indeed, of the world) such as had never been witnessed before, that facilities had been acquired for mobilizing capital at any particular point, under any conceivable circumstances, with a rapidity and in a volume that would prevent such conditions as arose say in the summer of 1893.

The present times should certainly test the adequacy of this theory. So far, it must be said, the combined banking interests have been measurably successful with their policy of "mobilization of finance." If they can accomplish as much with it in the next few weeks as they have in the last few, we may perhaps conclude that a beneficent agency of the first magnitude has obtained a permanent foothold in the domain of finance and industry.

But until that fact is clearly established, it will be natural:

for us all to speculate on what will be the outcome of the present situation if things are left to settle themselves by a natural process. In order to reach any conclusion at all, it will be necessary to look rather closely at the basic facts in the case. The first of these is that we have waked up to find ourselves in the midst of an over-extension of credit. The result is that credit is now being contracted as fast as possible. This leads to a very important question, Must credit be contracted to the point of inflicting an ultra severe hardship on general business?

I shall not attempt to answer that question. The most I intend to do is to point out one or two things which allow me to hope that the effect on general business is not going to be immoderate. First, a word with reference to the stock market. If money has become very short in supply, it is because a vast amount has been locked up in Wall street in the last few years. The time was reached some months ago when it was clearly seen that there was not enough loanable capital in the country to finance both general industry and stock market speculation at maximum speed and in maximum volume. Then began the process of withdrawing funds from Wall street in order to place them at the disposal of mercantile business. This movement reached a point of great velocity in October. Hence the financial situation that we discover today.

It is the easiest thing in the world to expand loans, but quite the most difficult to contract them. It certainly has not been easy to contract them in this case. To do so, it has been necessary to force tremendously heavy liquidation of securities, which in turn has shaken the confidence of a good many persons in the stability of the general financial situation. This sudden lack of confidence on the part of so many persons at once is what has done the business. Runs on banks are the very worst contingency which the financial world ever has to confront. Well, it was the realization of this fear of bank runs that produced such consternation in all minds recently. The danger, I hope, is now over, but the scared feeling has not yet vanished. However, the facts of the moment permit us to hope that the liquidation necessary to a restoration of the financial and industrial world to a sound basis will from now on progress in a way not to work intervening catastrophe.

The pertinent question now is, how far must liquidation extend in the matter of mercantile loans before the end is reached?

Naturally, on that point we must expect a great diversity of opinion. But there is one thing which I think we should never lose sight of. I refer to the gold production. The great increase in the gold production is the cause of the present situation, and sooner or later it will be its cure. In the last year or two the expansion of bank credits has outstripped the expansion of the gold output. What is now needed is a period in which the gold output can have opportunity to outstrip credits.

What must be the length of that period? Who can tell? It is barely possible that past financial crises will throw a ray of light on the matter. The year 1857 was in many respects like 1907. There had been a number of years of marvellous industrial expansion, the outgrowth of the California gold discoveries. Everybody then believed, as they have believed in the last seven or eight years, that a "new era" had been entered. It is worth noting, in this connection, that the panic of 1857 struck the country just about the time the gold output of the world began declining. Or take the panic of 1873. In 1870 the gold yield of the entire world was \$129,614,000. By 1873 it was down to \$96,200,000. In 1874 it was \$90,750,000. In 1875 it began to creep up gradually again, and in 1878 it was at \$119,092,000. Times were becoming good again then. But in 1883 the yield had got back to \$95,392,000, and, as will be recalled, we had a minor panic in 1884.

For years prior to 1893 the gold output had been on the increase, and it increased even faster during the four hard business years which followed the 1893 panic. This would seem to demolish the theory that the size of the supply is intimately connected with the approach and recession of hard times. But does it demolish it? must bear in mind that though before and after 1893 gold was increasing in output, it was nevertheless being withdrawn from the money channels of the United States. The Sherman silver law had set in operation Gresham's law—that is, an inferior currency was at work driving out of circulation a superior. While there was more gold in the world, there was less of it for the use of the banks of the United States. On the whole, we may perhaps consider it a good working hypothesis that financial hard times vary in length according as the gold supply is increasing or diminishing.

It only remains, therefore, to point out that nothing has happened at this time to retard the gold output. Everything in-

dicates that the increase in the yield will be fully as heavy in the next few years as in the last few. So far as can be seen the increase should continue at the present rate, at least, for years untold.

To all this, I feel like adding that our agricultural wealth this year is not small, that our farmers are free from the mortgage indebtedness which weighed so heavily on them in 1893, that there appears to have been no wide-spread over-production of commodities in the United States.

INTELLIGENT ACTION IN PREVENTING ACCIDENTS

By W. W. OSBORNE

In the year 1906 the Stone & Webster street railway properties paid damages growing out of accidents to the amount of approximately \$513,600. In some properties these charges show a distinct tendency toward material annual increases. There are instances where these increases are sufficient to menace dividends.

A princely fortune an annual waste! In these days of rigid economies this language sounds startling. What a field for the manager trained to realize that economy of management is attained only when every penny expended is productive of adequate benefit to the corporation.

Not all of this expenditure can be avoided. A certain percentage goes to maintain the various legal departments. Due allowance should be made for unjust claims unsuccessfully contested. So much of this tremendous expenditure as can be attributed to the negligent acts of employees can and should be saved. The latter class of expenditure is pure waste, is preventable, and easily amounts to a fortune every year.

To this problem of prevention of accidents should be brought the same measure of intelligence and the same systematic effort employed to effect economies in other departments of the service. If a ton of coal fails to produce the energy expected of it, such deficiency will straightway be apparent from the monthly report. It is then up to the manager to investigate instanter and discover the reason therefor. Possibly the coal is deficient in quality, or it may be that the trouble was with an ignorant stoker. In any event, the blame being rightly placed economy is effected, either by deductions from the coal bills or by the stoker being properly instructed or dismissed. The same course is pursued if the generating units are required to perform greater service than the traffic warrants; if the car mileage is not made; if the schedules are not adhered to.

The same intelligent and persistent supervision will unquestionably result in a diminution of the number of accidents and in a consequent reduction of expenditure for this account. No manager should ever allow himself to reach the conclusion that a certain percentage of accidents is inevitable or that a failure to have accidents is good luck. Such as are attributable to the negligence of employees, should ever be regarded by those having supervisory powers as evidence of managerial shortcoming.

SELECTION AND INSTRUCTION OF EMPLOYEES.

Necessarily the first care of the executive heads should be in the selection and instruction of employees. Hiring and discharging employees is the care of the superintendent of transportation. Applications in writing, upon blanks furnished by the company, should give all information concerning the applicant necessary to enable the superintendent of transportation to determine first hand the desirability or non-desirability of the applicant. References should be required in every instance. No man should be employed until his statements are verified and his qualifications thoroughly established. The superintendent of transportation should be thoroughly satisfied as to the character, temperament and habits of applicant before the person applying is accepted or employed. If this method of selection is carried out, a large majority of our employees will be men of good character and reasonably well equipped for the service.

The applicant having been then thoroughly instructed the weeding out process is in order. This is as important as the original selection. It is not asking too much of a superintendent of transportation to study the individuality of the men operating cars. Conscientious observation will soon give him a line on his men and enable him to get rid of such as from their temperament or habits he deems unsafe. We must next guard against laxness of service.

INSPECTION.

Experience has taught us that the very best of employees, if left absolutely to themselves, will sooner or later become remiss in carrying out instructions given. They must be held to their work by constant supervision. There is no way to enforce obedience to instructions and insure safety in operating except by unceasing supervision.

The expression "eternal vigilance" applies in its fullest significance. To insure safety in operating this vigilance may not be relaxed for a single moment. To properly guard against accidentaby neglect, the operator must feel that at no moment of the working day does the eye of the inspector cease to rest upon him.

Too much stress cannot be laid upon this subject. No matter how efficient men may seem to be, they will not remain efficient employees unless there is a most rigid system of supervision. By this I do not mean that inspectors should be martinets. Such a superviser is a disorganizer. Enough inspectors to properly watch the operator of every car at all times and unceasing vigilance on the part of such inspectors are absolutely essential to prevent disaster in operating.

It is not desirable that the inspector should have the right to discipline the operator. A caution should be the limit of his authority. The inspector's report at the end of the days' work, meaning possible suspension for a day or two, is what the operator will dread, and it is that which will make him the more careful. In this connection it may be said that if the operator is delinquent, severity of punishment does not produce the result sought. Certainty of detection in case of delinquency, together with slight punishment will beget care.

WHAT THE MANAGER CAN Do.

It is safe to say that whether the operators, inspectors, even the superintendent of transportation, hew to the line or not will depend ultimately upon the never ceasing efforts of the manager. He is the executive head, and the executive head is ever the main spring that moves every wheel in the watch. Constructively, his eye should be on every car at all times. The intelligent executive head will devise many ways for determining whether his employees, even to the humblest, are doing their duty, and where blame should rest for negligent conduct.

An intelligent executive head, upon assuming charge of a property, will give special study to local situations with a view to issuing general instructions as to the operation of cars over the various routes under his jurisdiction. A bird's eye view of the locality in which he operates will enable him to determine the points where the greatest care must be exercised to avoid casualties. For instance, where, by reason of the geography, the greatest trend of traffic is north and south he will probably find east and

west traffic greater on some streets than on others. the cross traffic the greater the danger of collision. In some places grades will be such as to make it more or less difficult to get a car under control at a danger point if it be allowed to attain speed in approaching thereto. In other places the grade of the street used by the crossing vehicle may be such that to insure against casualties the operator must not only be careful himself, but must guard against the want of care or even recklessness of the driver of the crossing vehicle. Many such situations will dot the map with danger spots and necessitate specific instructions on the part of the manager. A careful study of the traffic and of the local situation will enable the executive head so to frame his schedule that all danger points may be approached guarded by operators under specific instructions, and all under the eye of an inspector charged with the duty of seeing that instructions are carried out. All this may be done and yet the car mileage exacted be made also.

CLASSIFICATION OF ACCIDENTS.

Perhaps the most efficient means an executive head can employ to keep in thorough touch with the work over his entire lines will be a system of daily, weekly and monthly reports in which accidents are classified. No manager does his full duty to his property unless he requires a report of every accident to be placed on his desk every morning, so that he may be promptly appraised of the history of his casualties for the twenty-four hours preceding.

Monthly reports should be prepared by the claim agent, and the accidents classified so as to show (a) the name of person injured, (b) the place of injury, (c) the character of the accident, and (d) the names of the crew involved. He should know if it was caused in any of the following ways, (1) by derailment, (2) collision between cars and pedestrians, (3) collision between cars and vehicles, (4) accidents due to starting the car, (5) accidents due to stopping the cars, (6) accidents due to defective condition of cars, (7) accidents due to defective overhead construction, (8) claims growing out of difficulties between employees and passengers.

It will be surprising to know what a wealth of information these tabulated statements will furnish to an intelligent executive head. For instance, a derailment can be caused ordinarily in but two ways. It will be due either to a defective condition of the track or equipment or to reckless running on the part of the operator of the car. A collision between cars is the fault either of the car barn people by reason of a defective brake, or of the operator from reckless running.

Collisions between cars and vehicles are of most frequent occurrence. Usually they are the result of negligence on the part both of the driver of the vehicle and of the operator of the car. Having no authority over the driver of the vehicle, it becomes urgent that our operator should not only be careful himself, but should endeavor to guard against the possible negligence of the driver of the vehicle wherever possible. The tabulated statements above referred to will in the course of time show a great many of these kinds of collisions. Many of these collisions will occur at the same place. Recurring collisions between cars and vehicles at the same place will necessarily force the conclusion on the executive head that this particular spot is a danger point where excessive caution must be exercised to guard against negligent and reckless conduct on the part of the others. Such local condition disclosed as aforesaid should result in explicit instructions to the operator and to the inspector as to how to control cars at such points. Intelligent handling of such situations will eliminate accidents at such points.

As an illustration, I have in mind one point where a street car track crosses a paved street, the track at this point having a decided grade. The street was much used as a thoroughfare. The operator on the passing car could safely calculate that every time he approached that street he would encounter a vehicle undertaking to traverse it. Many collisions occurred at this point, yet no instructions were ever given operators as to how to handle their cars at this particular danger point. These repeated collisions cost the company a great deal of money. The claim agent insisted that the cars should stop at this crossing before undertaking to cross the street. The superintendent of transportation declined to issue such instructions on the ground that the schedule would not permit the stop. Things rocked along until a serious collision occurred, entailing considerable expense, when it was realized by all that something must be done. Strict instructions were finally issued to motormen as to how their cars should be handled at this point. Since this was done there has not been an accident there and the company has not expended a penny on that account. The schedule has not suffered.

Starting and stopping cars is a prolific source of accident. A

passenger undertakes to disembark from a car. He proceeds as far as the car step. When the conductor sees him put one foot on the ground he usually rings the bell. He knows by long experience that sufficient time will elapse between the time he rings the bell and the time the car gets in motion for the passenger to get clear of the car. In ninety-nine cases out of a hundred the passenger will disembark in safety. Sometimes the passenger will be a bit slow and will be thrown to the ground by the starting car, sustaining more or less injury.

It will be interesting to know how many hundreds of thousands of dollars have been paid out by street railway companies by reason of accidents caused by the failure of the conductor to allow a passenger sufficient time to get clear of the car before ringing the bell. Classified reports would at once indicate to the executive head the casualty itself and the name of the employee causing it. The superintendent of transportation would have the inspector watch the employee whom the accident reports showed to be guilty. Disciplining would make him good.

Let the manager thoroughly familiarize himself with local conditions. Let him know his lines and the traffic thereon. Let him study the traffic of the streets. Let him familiarize himself as nearly as possible with the individuality of his men. Let him require a system of tabulated reports such as I have indicated. He will then have the secret of the prevention of accidents. He can sit at his desk in his office and weed out inefficient employees. He can glance at his reports the morning after and come pretty near fixing the blame for inefficient service. Such service from an executive head must necessarily result in a reduction of the number of casualties, and can and should save the properties a fortune every year.

HOW TO ENCOURAGE MUNICIPAL OWNERSHIP

By W. H. BLOOD, JR

It was my fortune, whether good or bad depends on the way you look at it, to examine recently an electric lighting company operated by a syndicate whose ability is not often questioned. That the sentiment in the city was tending strongly toward a municipal lighting plant was plainly evident to me, but the management did not see it, would not believe it, and saw no reason for the growth of such an idea. Too close a view is apt to spoil one's perspective, and for that reason a new pair of eyes coming upon the scene sometimes sees things that are so close to the manager that his own nose, which he keeps down over his desk, obscures his view.

I do not propose to dwell upon all the defects that I found in this plant, for that would be a long story, but will outline only those which I saw in the street lighting system.

First, the contract with the city under which the company was furnishing light was vague and indefinite. That, however, was not altogether the fault of the company, for the city had insisted in specifying a light of 550 candle power. Nobody knew what that meant, but the city evidently tried to specify the light it had been getting in the past, "a nominal 1200 candle power."

The company was operating in a small city where there was hardly enough business to properly support it; yet, it had been bothered by serious competition, by burdensome legislation, etc., and as dividends were jeopardized the company was forced to start an era of retrenchment.

My examination revealed that the machines furnishing the current for the municipal lighting were of standard make, but that four of the circuits out of nine were habitually run with the current from 10 per cent. to 15 per cent. low, so low in fact that at times they "flashed over" because "the wind blew the lights out," as the

station attendant said. It was found upon investigation that two of the machines controlling more than half the number of lights were hand regulated. The automatic regulators, which were supplied with the machines had given trouble some years before because they would regulate a 25 per cent. overload and had never been repaired.

The next thing that was apparent was that the lights were not uniform, and upon testing them it was found that while some ran at 50 to 56 volts across the arc others only ran at 25 to 30 volts, and only comparatively few ran at the standard of 45 to 47 volts. The cause of this variation was easily explained when it was learned that the repairmen adjusted the arc entirely by eye, no voltmeter was ever used. A boy eighteen or nineteen years old was alone responsible for the proper operation of some 600 lamps. Shunt coils of his winding were continually burning out, but as he had plenty of time he kept on winding them.

Paint and lamp hoods were not even on speaking terms and the lamps themselves looked as though they had been handed down from a previous generation. Globe holders were of several makes and no one of them had screws enough to hold the globes. Arc globes were ringed and streaked. The light cast upon the street under the lamps reminded one of a tiger's skin, but was not nearly as pretty. A large proportion of the globes were broken, the holes being larger than one's hand, but it was explained that "they were little ones" and that "the globes were never changed unless they were liable to fall off and hurt someone." This, of course, accentuated the contrast, and the accumulation of carbon dust and dirt which should have been brushed out each day but which was not, caused the illumination to be most unsatisfactory. globes broke easily, it was explained, because "they were cheap." "The company only paid 38 cents apiece for them-good ones could have been bought for 42 cents." English sparrows undisturbed occupied the upper story of the hoods and the hay which did not go into the nests was all caught in the globes beneath. Many of the globes had extra carbons reposing in them and these added to the unpleasant shadows below. "They were short ones which could be used in the lower holders," it was explained.

The lamps were so hung in many places that the shadows from the side rods ran up and down the streets, while porches of nearby residences where privacy was desired were flooded with unpleasant lights. A few lamps were hung so low that a six

footer could have reached them, while others were hidden in the trees.

Take it all and all NEGLIGENCE was written on every lamp and the very qualities of mismanagement that are generally attributed to a municipally operated plant were everywhere apparent. The city could do no worse—it might do better. Is it any wonder that with the facts as I have stated them, with a populace always ready to "knock" the corporation, with an administration ready to spend the people's money, and with an energetic politician looking for some popular cry to assist his election as mayor of the city, municipal ownership should be easily permitted?

It is to be hoped that none of the Stone & Webster companies are in this condition, but it behooves each one of our managers to see that the service given to the city in lighting its streets is as nearly perfect as possible. It is a duty which the company owes to the city, it tends to make the company popular, it costs very little additional, and it is a great deterrent of municipal ownership.

THE STREET RAILWAY CONVENTION

By LEE H. PARKER

During the week ending October 19, the American Street and Interurban Railway Association held its annual meeting at Atlantic City. This is the first time the convention has been held at this delightful resort. The Atlantic City Hotel Men's Association on October 14 submitted a proposal for the building of a convention hall, so that the American Street and Interurban Railway Association would make Atlantic City its permanent convention place.

The Stone & Webster interests were represented by a large delegation of accountants, some thirty in number, and by the following gentlemen: Messrs. C. D. Wyman, Boston; W. S. Dimmock, Tacoma; J. B. Lukes, Seattle; V. W. Berry, Dallas; H. T. Edgar, Fort Worth; J. W. Leadley, Pensacola; W. C. DeVane, Savannah. Messrs. D. P. Robinson, president, and Lee H. Parker, railway engineer, represented the Stone & Webster Engineering Corporation. The delightful weather throughout the entire week assisted largely in the success of this year's convention. The spacious Steel Pier was entirely occupied by a very carefully arranged line of exhibits. There were something like three hundred exhibitors.

The papers read before the affiliated associations were exceedingly well prepared, and were generally ably discussed at considerable length.

The Entertainment Committee had prepared an excellent program for the week. The Third Annual Supply Men's Vaudeville and Theatrical performance on Thursday night at the Young's Pier theatre was especially fine. Several manufacturers entertained their friends on sailing and fishing parties, and there were many other pleasant diversions, such as golf, automobile trips, etc., which added to the pleasure of the occasion.

The first Atlantic City convention was voted by all in attendance to have been an unqualified success. Many expressed the hope that the Executive Committee would finally arrange to hold the future conventions at Atlantic City, at least for the next four or five years.

FEATURES OF THE STREET RAILWAY CONVENTION

The largest, and in the opinion of many in attendance on the occasion, the most successful convention of those interested in the street and interurban transportation business was held recently at Atlantic City. In point of numbers, we believe no meeting of the Association can boast of so full a list of delegates and guests, and in point of interest, the papers read and discussed, the exhibits of apparatus, and the general range of subjects touched upon in the public meetings and in the executive sessions, covered a field the length and breadth of which was quite beyond that embraced at any of the Associational meetings of previous years.

The business sessions were initiated by the meetings of the Accountants' Association, the Engineering Association, and the Claim Agents' Association, which began their sessions on Monday, the 14th, and with an exceedingly good attendance continued during Tuesday and Wednesday. As a general invitation to these meetings was extended to all delegates, irrespective of their membership in any one of the Associations, the audiences at these various sessions included many who were neither accountants, engineers nor claim agents, but who were glad to be present and listen to the interesting papers presented and the discussions which followed their reading.

The topics considered were varied, timely and important. In the Accountants' Association the question of depreciation was one to which a great deal of attention was given, and since it is a live topic with all transportation companies, the ideas as expressed in the Accountants' Association—a full account of which will be found in the proceedings as published in the technical journals—will be of great service to our companies. We commend to all of our representatives the careful reading of these proceedings.

Perhaps one of the most important papers presented at the Engineering Association meeting was the report of the Committee on "Standardization." The committee into whose hands this question was entrusted have during the past year had a number of

sessions and have given to the subject most careful thought and study, and the report they presented—which was adopted by the Engineering Association and subsequently adopted and approved by the parent Association for all the companies embraced in the general organization—is one which sets a standard for axles, journals, journal bearings and journal boxes, for brake shoes, brake shoe heads and keys, for tread and flange of wheel, and for rails, which we feel sure it will be thought wise by all companies in the electric street and interurban business to adopt so soon as they can arrange to do so, taking into consideration local conditions and the present state of equipment. It goes without saying that the multiplicity of designs and patterns which have come into use through the years of practice and experiment by various companies has resulted in an increase of cost of equipment for both track and cars to manufacturers, and therefore to their customers, and when it shall be possible by adopting some general standards to reduce this great variety of forms, very great economy in this department can be secured. We feel that this report merits the careful attention of all the managers and engineers connected with our companies, and to aid in the matter we have included the report in full in the present issue of the "Journal."

The Claim Agents' Association, representing, as the President of that Association put it, the most unpopular department in the organization of transportation companies, since in its work it does nothing but spend money and apparently brings nothing in, considered such questions as "How to manage bad cases," "The selection and training of investigators and adjusters for the Claim Department," and "Instruction of employes in accident work," all of which topics appeal to street railroad operators and are exceedingly pertinent in their line of work.

In fact, the meetings of the affiliated Associations mentioned above were so full of interest that the delegates found the choice of which ones to attend most difficult, and many at the convention would have liked to possess the power of dividing themselves into three parts, so that they might not miss any of the good things which had been prepared for their instruction and edification.

On Wednesday the proceedings of the main convention—the American Street & Interurban Railway Association—began, and until Friday its deliberations occupied several hours of each day in consideration of matters of the utmost importance to our railway interests The range of subjects considered was a very wide-

one, and among these may be mentioned "The relations of technically trained men and the electric railway profession," discussed in a paper by Professor H. H. Norris of Cornell University, "Light freight handling by electric lines," and "Freight service on electric railways," by practical railroad men. 'The questions of publicity and advertising from the standpoint of the street railway company were most admirably presented and illustrated, and the discussions which followed all these papers were illuminating and most useful. The reports of the Committees on "Municipal Ownership" and "Public Policy" attracted a great deal of attention and suggested points for personal discussion among the delegates which they were not slow to utilize. This one element of the convention, so far as our observation went, was a principal feature of the occasion. The papers and the discussions indulged in upon the floors of the meeting halls formed but an infinitesimal part of the general body of discussion and exchange of experiences which was had between the members privately as they met one another at the hotels, in the exhibit halls and other points of central inter-This mutual interchange of views between friends and acquaintances and the story told by one to another of the methods adopted to meet conditions as they affect operation in different cities and parts of the country, are marked features in the list of benefits which attendance upon a convention of this sort affords. The social features were exceedingly pleasant, every effort being made by those in control of the machinery of the convention to bring together the delegates in a pleasant way for mutual acquaintance.

The Manufacturers' Association has every reason to congratulate itself on the excellent exhibit of railroad equipment and material which it brought together on the occasion of the convention. While we have seen no definite figures comparing the number of exhibitors with those of previous conventions, we are of the impression that at Atlantic City as many, if not a larger number of, manufacturers and dealers in railroad and electrical equipment were present with samples of their wares as were assembled at any previous convention of the Association. In point of fact, the exhibition space was so full of examples of the various kinds of apparatus and material which are in use by traction companies, or which were for the first time being introduced to the attention of street railroad men, that the time alloted to the delegates to examine the same was all too short; and in mentioning a few of

what might possibly be called novelties in the way of useful articles presented for inspection and use, we must not be understood as purposely passing by many others which were on exhibition, but to which we were unable to give our attention.

We were attracted by the exhibit of the Lumen Baring Company, of Buffalo, New York, who showed a steel trolley wheel for which a long service was claimed. This wheel consisted of two steel sides having an insert at the bottom of the wearing groove and for the bearing of copper. This insert was forged and then turned perfectly true and so affixed to the steel sides that the whole wheel was practically homogeneous. The exhibitor claimed that the copper insert was so absolutely true in its rounded surface that its bearing upon the trolley wire would be more perfect than that of the ordinary copper wheel, and, moreover, that the wear upon its surface was less, since the weight of the entire wheel was perhaps only 50 per cent. of that of the ordinary copper wheel, and that therefore the tension required to keep it in place was much less, with a consequent reduction of wear. Some figures presented by the company of service given by this wheel in comparison with the Kalamazoo trolley wheel would seem to bear out the claims made. The question of salvage on the old wheels was discussed with the exhibitor, and he stated that the company would take back the wheels at a fixed price when they were worn out.

An interesting exhibit also noted was that of the Lackawanna Steel Company, of Buffalo, at whose booth a variety of joint and tie plates for track were shown. A rail joint plate for strengthening and improving the efficiency of the ordinary angle bar joint was attractive, on account of the simplicity of its construction and its ease of use. This plate can be applied without disturbing the angle bars and forms a short deck bridge between the two joint There is a slight camber at the center of the plate to insure the rails first taking bearing at ends and thus bringing the plate into action before any deflection takes place in the splice bars. The end or corner lugs act as anti-creepers and as guides to the rails. The plate is sold by the pound and seems to be fairly inexpensive. We suggest that our managers inform themselves as to this plate, securing literature on the subject from the Lackawanna Steel Company, the main office of which is at No. 2 Rector Street, New York City, with branch offices in a number of other principal cities.

Our interest having been excited by the plate above referred

to, we took occasion to examine the "Bonzano" rail joint, which in form somewhat resembles the "Abbott" tie plate but goes farther than the latter in including splice bars in its general design. This plate is presumed to effect the same result as the "Continuous" rail joint or the "Webber" joint, and we understand it has been used very successfully by a number of companies. Its make-up is simple and we should judge very effective, and a more careful study of it would probably be of interest to the managers of our companies, though quite likely their attention has already been attracted to it. A description of the apparatus can be secured by writing to the Quincy, Manchester, Sargent Company, Old Colony Building, Chicago, or 114 Liberty Street, New York City.

Quite a number of Automotoneers were on exhibition. Differences of opinion by operators of cars as to the utility of these devices were expressed, but all seemed interested in the question. By the exhibitors, very strong claims were made that the use of the Automotoneer would effect a saving in armatures and in power. Some figures were submitted to the effect that of forty cars, twenty of which were equipped with a regulator and twenty were without such an apparatus, running from the same barn, with the same mileage and under the same general conditions, for four months, the twenty not equipped with regulators lost twenty-nine armatures and the twenty equipped lost only seven, or, at a cost of \$40 per armature, the twenty not equipped with the regulators cost per car for the maintenance of armature equipment \$174, while for the twenty so equipped only \$40 was expended. One of the Automotoneers or regulators shown was that known as the "Durkin" regulator, named after the inventor, who explained that he had been a practical railroad man and master mechanic for some years, and therefore had been aided greatly in the perfection of his invention by his practical experience. The Durkin Controller Handle Company, at 1003 Arcade Building, Philadelphia, will be glad to supply any of our managers with literature descriptive of their apparatus, should any desire further information upon the subject. The Lord Electric Company, of Boston, also exhibited an automatic regulator which had several good features. The rather general opinion with reference to this kind of apparatus seemed to the writer to be that on some lines, especially those of a suburban character, the motor regulator might be particularly useful. any rate, the price of the apparatus being reasonable, it would be comparatively inexpensive to make an actual test of it.

In the matter of signals a number of devices were shown by different manufacturers. The signals of the United States Signal Company and of the Eureka Signal Company and the "Nachod Automatic Signal" all were shown and installed in such a way as to exhibit their operation under actual practice. With the increase of interurban single track lines, the value of some sort of signal, we take it, is becoming more and more important. The "Nachod Automatic Signal," manufactured by the United States Engineering Company at Philadelphia, and installed and in present operation by the Pacific Electric Company of Los Angeles, California, attracted not a little attention. This signal claims a number of advantages, such as counting any cars that enter a block, and having only one wire between stations. We were impressed with the immercion in oil of the relays used in operation, which enabled a wide voltage range, constantly lubricated the parts, and ought, it appears to us, to prevent the pounding loose or getting out of adjustment of the parts, since the oil cushions the magnet action. We would suggest that our managers who have occasion to study the question of signals for any of their lines, investigate this particular one in connection with others that have been a longer time upon the market.

In an exhibition of car seats by the Hale & Kilburne Manufacturing Company, of Philadelphia, a base or end standard and working parts of pressed or drawn steel were exhibited and explained to a constant stream of visitors. The strength and the light weight involved by the use of steel as against that of iron castings were apparent. A car seat shown with a steel base and frame was stated to weigh seventeen pounds less than a seat with the usual iron castings, while the expense of the former varied but little from that of the latter. The savings in power effected by reason of the lighter weight to be carried about is very evident when we consider the lighter seat, and we are glad to call this new improvement in car seats to the attention of our managers.

The Ohmer Car Register Company presented an electric device for the operation of their register which was interesting and novel. There was also shown a hand register and collection box for fares, designed to take the place in the United States of what is ordinarily known in Canada as the "coffee pot collector." The apparatus could easily be held in one hand and was so arranged that the money passed completely through it into the hand of the conductor and the nickels so collected could be used by him in

making change for a passenger who presented for fare something larger than a single nickel. Upon the deposit by the passenger in the top of this small box of the fare or of a ticket a bell was rung and a registration effected automatically, and the conductor was obliged to press a button to open the register each time for the collection of an individual fare. The apparatus was an ingenious one and if used in connection with a "Pay-as-you-enter" car might work out very well.

The exhibit of the Canadian car known as the "Pay-as-youenter" car was a never failing source of interest to the delegates and excited among the members present more discussion, probably, than any other one device displayed at the convention. The Chicago city road, we are informed, has recently ordered a number of these cars, and the Interborough-Metropolitan system in New York expects to put several hundred in use ere long. The theory of a passenger paying his fare as he enters the car and thus obviating the necessity of a conductor going inside the car at all and crowding passengers who may be standing in the aisle, is one which will appeal to railroad operators, and if the claims which the promoters of this kind of vehicle make shall be sustained—namely, that at least 25 per cent more of fares are collected and turned in to the treasury of the company than by the ordinary method, while accidents to passengers getting on or off the car are reduced by a much larger percentage—the "Pay-as-you-enter" car is likely to become very popular.

The General Electric Company's exhibit was especially fine this year. The company had a large space near the entrance of the pier, where considerable of their recently brought-out railway apparatus was displayed. A large corps of their representatives were on hand to explain the new products in detail. There were some fine samples of commutating pole motors. Curtis turbines, control apparatus, etc. on exhibition. Perhaps some of the most interesting things shown were the K-34 and K-35 controllers. The first of these is designed to handle either two 150 or four 75 H. P. motors rated at 550 volts, and the latter will handle two 100 H. P. or four 60 II. P. motors and less. The K-36 controller is also designed to handle two motors only of a capacity of 60 H. P. or less. As quite a few of the later railway motors are rated on a basis of 600 volts, it is readily seen that the capacity of these controllers at this voltage will be correspondingly increased. A few of the interesting features of this type of controller are its having the operating handle directly connected to the operating cylinder without gearing, also having the operating handle on the "off" position more to the front of the car, which seems to us to be of great
advantage. The reverse switch and handle are located at the left
of the controller, permitting better arrangement of the new styleof magnetic blow-out. These controllers provide six breaks in
series when opening the circuit. This is of especial value in city
work, where motormen have to nose through dense traffic and
have frequently to throw on and off from the first position. It was
brought out in the discussion that the combined weight of two
K-35 controllers as compared with the combined weight of two
K-28 controllers with the two contractors would be in favor of the
K-35 probably by one hundred pounds.

We should like to call the attention of our managers of roads in the North to the Cooper heater which was displayed at the convention. There are four sizes of these heaters, the smaller being adapted for small city cars, while the largest is for interurban cars. They are manufactured by The Cooper Heater Company, Dayton, Ohio. It is claimed for these heaters that they have more heating surface within given dimensions than other heaters on the market, and that they occupy less space and do the work on about one quarter the amount of fuel. The Cooper heater looks like a good article, and we believe it would give a good account of itself wherever used.

Among other interesting exhibits were those of the Westinghouse, General Electric and Ohio Brass Companies, catenary trolley line material. The comparatively rapid introduction of single-phase roads throughout the country and the later development of 1200 volt direct current work have brought the matter of catenary trolley construction prominently before the railroad world. There are some 600 volt direct current interurban lines which are considering the adoption of the catenary trolley. The Engineering Corporation is prepared to furnish full details to managers regarding catenary construction on request.

The Westinghouse Company had a very interesting exhibit of a combination automatic car and air coupler. This is being tried out thoroughly on various roads through the country, and we expect to see some excellent results obtained with it.

STREET AND INTERURBAN ACCOUNTANTS' ASSOCIATION MEETING

By A. STUART PRATT.

The meeting at Atlantic City of the accountants' branch of the Street and Interurban Railway Association had this year unusual interest for the Stone & Webster Organization. This interest was caused by a large number of Stone & Webster accountants present at the meetings.

The assistant treasurers of almost all of the companies managed by Stone & Webster met at Atlantic City to attend the convention there, and their names and the companies to which they are attached are listed below:

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are attached are listed below:
Charles H. Winslow Blue Hill Street Railway Co.
George E. ChaseBrockton & Plymouth Street Railway Co.
J. H. Leitch Cape Breton Electric Company, Ltd.
A. A. WilburColumbus Railroad Company.
P. P. ThomasDallas Companies.
L. A. BowersDallas Companies.
H. C. Smith Edison Elec. Ill. Co. of Brockton.
H. K. Silsbee El Paso Electric Railway Co.
A. DrouilhetGalveston Electric Company.
J. Harry DuFresne Houghton County Companies.
H. L. Harding Houston Electric Company.
William H. TuckerJacksonville Electric Company.
Arthur F. ButlerLowell Electric Light Corp'n, The
H. B. Sewall Minneapolis Gen. Elec. Co., The
A. W. Q. BirtwellNorthern Texas Companies.

Frank Dabney......Seattle Electric Company., The C. H. Byrne.....Tampa Electric Company.

J. C. Hector......Whatcom County Ry. & Lgt. Co.

In addition to the above, the Home Office was represented by

J. E. Bigham Paducah Companies.
R. G. Carroll Pensacola Electric Co.
R. H. Eaton Savannah Electric Company.

A. Stuart Pratt, treasurer of all the Companies, A. S. Michener,

comptroller, W. W. Beckett, chief accountant for the firm, G. C. England, assistant treasurer of the Stone & Webster Engineering Corporation. The familiar face of Mr. A. R. Patterson, chief of the auditing department was missed, as he was detained in Boston on account of his work in connection with the investigation of the New England Telephone & Telegraph Company, now being conducted by the Massachusetts State Highway Commission. His department was, however, well represented by Messrs. E. R. Adams, C. H. Allen, and W. R. Leonard.

The meetings of the Association were regularly attended, but as matters discussed were largely technical, they will not be touched upon here.

The time between sessions was spent in renewing old asquaintances and in making new ones.

At the close of the Convention the trip to the Home Office was begun and all arrived in Boston on the morning of October 18. The boys spent the day in viewing the city and suburbs by automobile, and in meeting old friends in the office. In the evening a reception and dinner at the Exchange Club were given the assistant treasurers by the firm.

The other invited guests were the accountants just returned from Atlantic City and the members of the auditing department and treasurer's office. Mr. F. S. Pratt, one of the vice-presidents of the Management Association was present, and Mr. John W. Leadley, manager of the Pensacola Electric Company, the only visiting manager at that time in the city, also graced the occasion with his genial personality. After giving a hearty welcome home to the assistant treasurers, Mr. A. Stuart Pratt, who presided, introduced Mr. Henry B. Sawyer as the future treasurer of the Stone & Webster Companies. Mr. Sawyer responded in well chosen words and short remarks were made by others present. dinner was enlivened by music, and on the conclusion of the speeches, Mr. W. B. C. Fox, the well known entertainer and his associates, interested and amused the diners for an hour or more. The evening closed with a general feeling of comradeship and hearty loyalty to the firm.

The next day informal meetings were held to discuss accounting subjects, and in a few days the visiting assistant treasurers departed singly and in groups for the various cities in which they are located.

The value of such a gathering of men employed by the same

firm and having similar duties in different localities can not, perhaps, be measured in dollars and cents. There is nevertheless a distinct commercial value which without doubt more than covers the cost in time and money. The individual is broadened. He talks with others in his same line and gets new ideas. He realizes the extent of the organization of which he is a part, and his loyalty to the firm is increased by his increased knowledge of the wide scope of their activities and by his increased pride in knowing himself to be a part of such a successful organization.

The trip will live in the memory of the participants for many a day and help smooth the rough path of hard work.

STANDARDIZATION OF ELECTRIC TRAC-TION EQUIPMENT

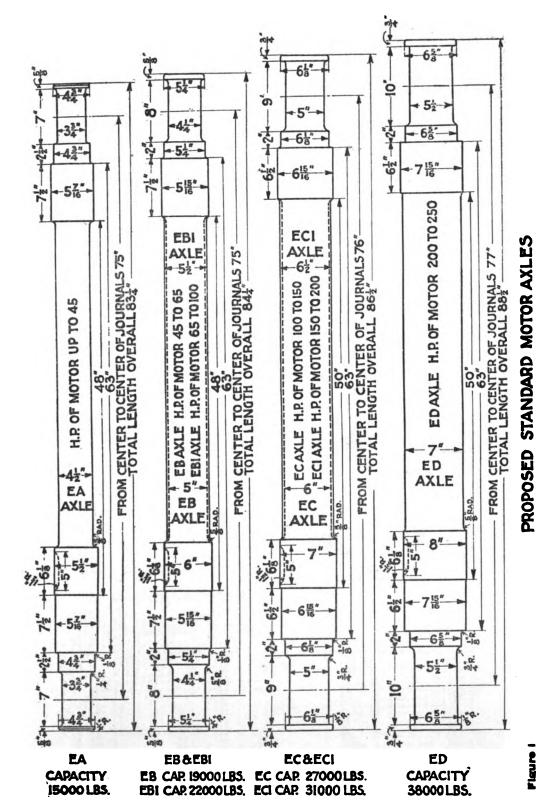
The report which the Committee on Standardization made to the annual convention of the Street and Interurban Railway Engineers' Association at Atlantic City, on October 15, and which was approved and adopted by all member companies of the Association, was a production of unusual value. In order that it may be brought as speedily as possible to the attention of those interested in the management of the Stone & Webster Companies, it is reproduced in full below.

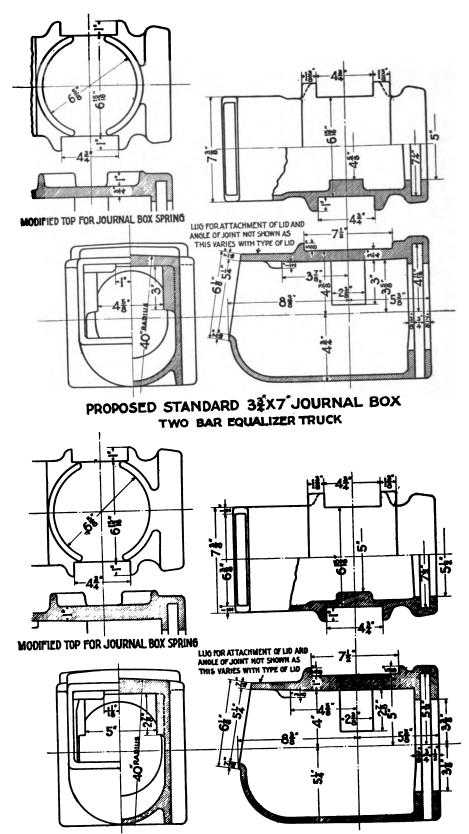
Your committee appointed to investigate the subject of standardization as applied to electric traction equipment reports that it has proceeded upon the lines laid down for this committee in the year 1906, and has investigated the same topics, namely:

- (a) Standard axles, journals, journal bearings and journal boxes.
 - (b) Standard brake shoes, brake shoe heads and keys.
 - (c) Standard section of tread and flange of wheel.
 - (d) Standard rails.

Considerable work on all of the above subjects was done by the committee during the year 1906, both previous and subsequent to the convention at Columbus, and all the information given in the data sheets was compiled in tabular form for consideration by the committee.

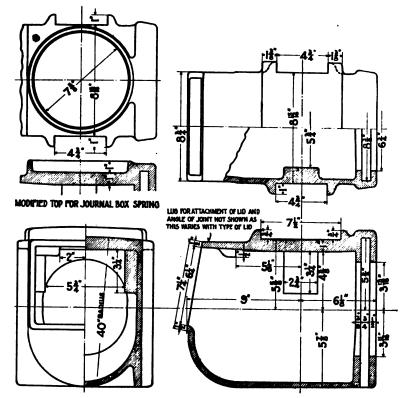
It was subsequently decided desirable to have the subject of rails considered by the Way Committee. All the information received on this subject was turned over to that committee by direction of the president, and that committee will submit a separate report. This committee has considered the subject of rails and special work only as affecting the recommendation of a standard wheel tread and flange.



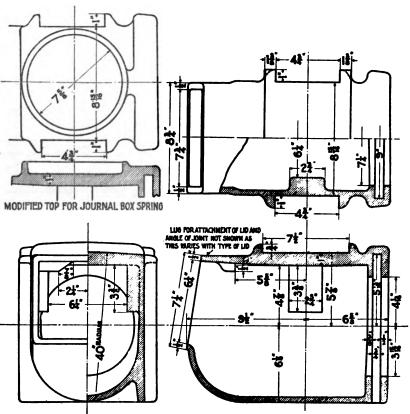


PROPOSED STANDARD 44 X8 JOURNAL BOX

Figure 2



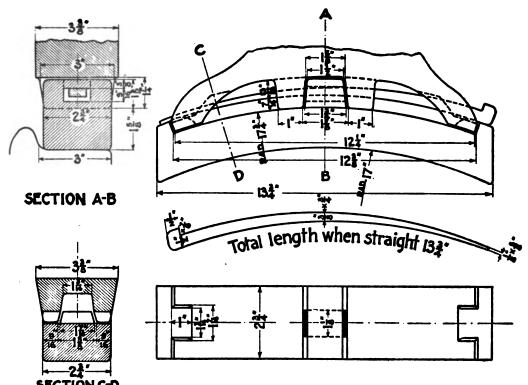
PROPOSED STANDARD 5'X9' JOURNAL BOX
TWO BAR EQUALIZER TRUCK



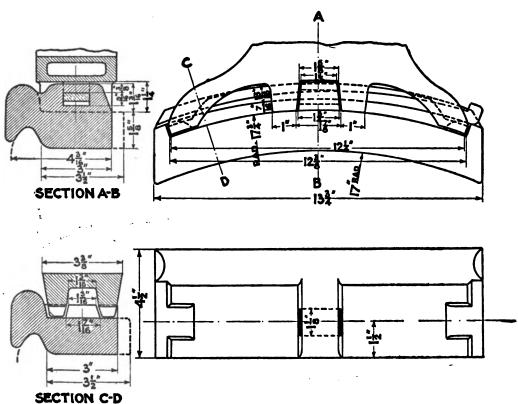
PROPOSED STANDARD 54 XIO JOURNAL BOX
TWO BAR EQUALIZER TRUCK

Figure 3

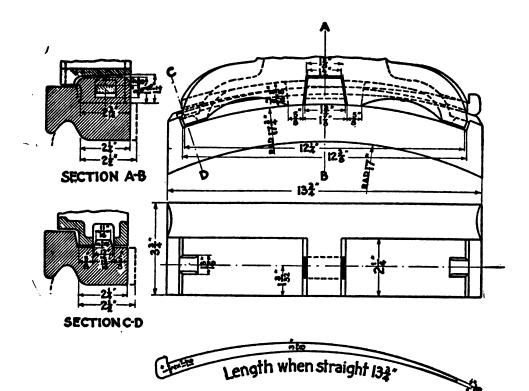
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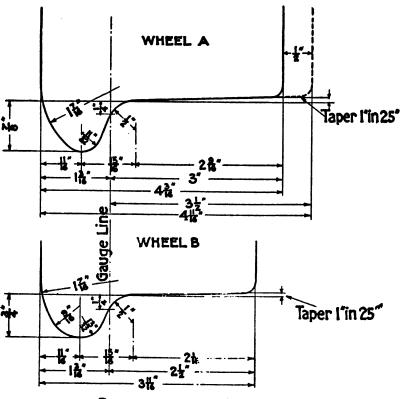
SECTION C-D
Proposed Standard Brake Head, Unflanged Shoe and Key
For wheels with 3'tread and over.



Proposed Standard Brake Head, Flanged Shoe and Key For wheels with 3" tread and over.



Proposed Standard Brake Head, Brake Shoe and Key For narrow tread wheels.



PROPOSED WHEEL SECTIONS

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				TABLE	9 I. BC	MMARY	OF AX	CE AND	TABLE I. SUMMARY OF AXLE AND GEAR DATA.	TA				
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		Motor	Gear	Wheel D	distance	Centers			Length		Gear	motor	gear h	ube.
	Journals,	Ð,	Ðt,	Bt, D	etween	Jo	capac-	Horse-	of gear.	Gear	face,	bearing	Wheel	Motor
Type.	inches.	inches.	inches.	inches.	habs.	journals.	<u> </u>	power.	seat.	pitch.	inches.	fange.	side.	side.
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EB	4½ by 8	1 0	•	5 15-16	\$	15	19,000	\$	*	•	20	œ	-	*
EB1	41% by 8	**	9	5 15-16	æ	35	22,000	65-100	*	60	10	œ	1	*
EC	5 by 9	•	-	6 15-16	8	92	27,000	100-150	*	% 2	76	*	*	×
EC1 :	5 by 9	*6	1	6 15-16	8	J 6	81,000	150-200	\$	ž	ž	% 8	*	×
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In order thoroughly to study the conditions affecting the above subjects, the committee held meetings in New York on May 20 and 21, in Cleveland on July 26 and 27, and again in New York on September 12 and 13, 1907. At each of these meetings representatives of the various manufacturers of all the equipment under consideration were present, and materially assisted the committee in arriving at the recommendations which are embodied in this report. Abstracts of the discussions at these meetings have been printed and widely circulated and this has resulted in a favorable sentiment toward the subject of standardization. The committee appends the stenographic reports of its meetings, blue prints, and other information obtained bearing on the subjects under discussion.

(a) STANDARD AXLES, JOURNALS, JOURNAL BEARINGS AND JOURNAL BOXES.

A consideration of this subject disclosed that it would be very difficult to adopt standards which would accommodate, to any general extent, the equipments already in service. After a thorough discussion by the representatives of all the interests involved, this committee decided to recommend arbitrary dimensions which conform to what is believed to be the very best recommended practice, at the same time meeting as nearly as possible the requirements of the existing conditions. The dimensions proposed very nearly approach the standards adopted by many of the large electric railway properties of the country.

In this connection the committee has profited very materially by the experience of similar organizations which have developed the axle problem since the beginning of operation of railroads in this country, and this was found to be not only valuable in taking advantage of what experience had taught, but also desirable from a commercial standpoint.

We, therefore, recommend the axles shown in Fig. 1 and designated as EA, EB, EB-1, EC, EC-1, and ED. A general summary of the axle and gear data is given in Table I.

Axic EA has a journal of 3.75 by 7 in. It is designed to carry a load of 15,000-lb. per axle and for the accommodation of motors not to exceed 45 h. p. capacity.

Axle EB has a journal 4.25 by 8 in. and is designed to carry a load of 19,000-lb. per axle and for motors not to exceed 65 h. p. capacity.

Arle EB-1 has the same general dimensions as axle EB, except that it is 5.5 in. in diameter at the motor-fit. It is designed to carry 22,000-lb. per axle and for motors not exceeding 100 h. p. capacity.

Axle EC has a journal 5 by 9 in. It is designed to carry a load of 27,000-lb. per axle, and is intended to accommodate motors not to exceed 150 h. p. capacity.

Axle EC-1 is of the same general dimensions as axle EC, excepting that the diameter at the motor-fit is 6.5-in. It is designed to carry 31,000-lb. per axle and to accommodate motors not exceeding 200 h. p. capacity.

Axle ED has a journal of 5.5 by 10 in. and a carrying capacity of 38,000-lb. per axle. It is designed to accommodate motors not to exceed 250 h. p. capacity.

Axles EA, EB and EB-1 are to accommodate motors that do not require more than 48-in. between the wheel hubs, and axles EC and EC-1 and ED are to accommodate motors that do not require more than 50-in. between the wheel hubs.

Particular attention is directed to the dimensions given on these axles, all of which were worked out with a great deal of care by the committee and were adopted only after a very careful consideration of each and the relation of each to all the others. This applies with particular emphasis to the diameter and length of wheel-fit, diameter and length of gear-fit, the gear keys and the diameter of the motor-fits. The discussion in connection with these subjects developed that the dimensions recommended by the committee are the most desirable and very acceptable to the manufacturers of the different parts of the equipment. Their original adoption will result in eliminating a great variety of dimensions of these parts. This lack of uniformity in the past has worked a particular hardship, not only on the manufacturers, but also upon the companies operating the equipment.

Special attention is directed to the length of gear seat and the key way, as well as to the diameter of the gear hub and the width of gear face, as it was found that by adopting these dimensions, the motor builders would be able to arrive at a uniform gear practice.

It is further recommended that for motors not to exceed 100 h. p., a three-pitch gear with 5-in. face be adopted as standard; and that motors exceeding 100 h. p. should have a 2.5-in. pitchgear with a 5.25-in. face.

JOURNALS AND JOURNAL BEARINGS.

For journals and journal bearing keys we recommend the use of the four sizes known as the Master Car Builders' standards.

These are the result of years of experience in equipments of similar character and generally familiar, and are specified in reports of the proceedings of that association.

JOURNAL BOX.

In connection with the axles already recommended, we submit herewith Figures 2 and 3, showing journal boxes for each of the different journals recommended, showing two styles of design for the tops of the boxes to accommodate the two styles of trucks generally used in electric traction equipment. The interiors of these boxes are arranged to accommodate the journal bearing keys referred to above and will be subject to the test gages in common use for journal boxes of this character.

(b) Brake Shoes, Brake Shoe Heads and Keys.

Your committee believes that this feature of the equipment most readily permits of standarization and that the results obtained therefrom, both mechanically and commercially, will be most desirable.

The data sheets compiled by your committee show that at the present time there are innumerable styles and patterns of brake shoes and brake heads in use throughout the country, many of which vary but slightly from the recommendations which your committee herewith submits.

For wheels having a tread of 3-in. wide and over, your committee recommends a design of brake head and shoe (see Figure 4), both of which are interchangeable with those in general use in steam railroad practice. The brake head recommended is adapted to both the flanged and unflanged shoes. The unflanged shoes to go with this head are reversible on their own wheels, and the flanged shoes may be reversed by changing the shoe from end to end on the brake beam.

To accommodate wheels in service, with treads narrower than 3-in., the committee deems it advisable to recommend the brake head and shoe illustrated in Figure 5. This head is adapted for use on any of the narrower tread of wheels, viz., those less than 3-in. wide. The brake shoe can be used either flanged or unflanged, the unflanged shoe being reversible upon the same wheel and the flanged shoe will be reversible by changing it to the other end of the brake beam, thus requiring but one pattern of brake shoe for all equipment which will be standardized with this brake head.

No attempt has been made at this time to suggest a standard for the brake head hanger arrangement, as the patterns submitted are simply for the brake shoe attachment. For the brake head shown in Figure 4, it is intended to use the brake shoe key now in general use.

(c) STANDARD SECTION OF TREAD AND FLANGE OF WHEEL.

The investigation by this committee of the various types of wheels in service on electric traction properties throughout the country shows that there is a very wide variation of wheel sections in use, especially as regards flanges and treads. An inspection of the data sheets demonstrated that it was almost impossible to select one wheel which would meet all the varying conditions. These sheets also showed conclusively that wheels of a considerably narrower tread than the increased weight of the equipment requires are being operated. Your committee, therefore, recommends as standard for street and interurban railways as far as it can be applied, a wheel tread and flange contour which conforms to that shown in Fig. 5 and indicated as Wheel A, this wheel to have a tread 3-in. wide and a flange 7-8-in. high and 1 3-16-in. thick at the throat. It is the opinion of the committee that this wheel tread and flange can be applied with comparatively little difficulty to a great majority of the roads forming our association.

A number of roads are using wheels with a tread 3.5-in. wide for combined city and interurban work, and there is a decided tendency in this direction. This wide tread assists in carrying the load across special work without running on the flange, and avoids the necessity for flange bearing on the special work. We, therefore, also recommend Wheel A with the tread increased to 3.5-in. for interurban work, and also for city work where it can be used. In the judgment of your committee, it is especially desirable to work toward the general adoption of wheels having this tread.

Your committee recognizes the fact that local conditions on many of the systems forming our association are such that it will be difficult for a number of years to operate a wheel of the dimensions represented by Wheel A. To meet these conditions your committee recommends Wheel B (Fig. 5), with a tread of 2.5-in. wide and a flange 0.75-in. high, this flange to have the same general dimensions as Wheel A with the exception of the height above the tread line.

In mounting and gaging wheels it is understood that the gage

line is at a point on the flange 0.25-in. above the wheel tread, and your committee recommends that the wheels be gaged 0.25-in. narrower than the gage of the track, the track gage being measured between points 0.25-in. below the tops of the rails.

RECOMMENDATIONS FOR FUTURE WORK.

The investigation conducted by this committee during the past two years indicates the need on the part of the association in the future for a standing committee or standing committees to take charge of the changes and progress in electric traction equipment. The extent of the field suggests the desirability of dividing the subject among various committees as has been found necessary in the case of similar work carried on by other associations.

CONCLUSION.

In making these recommendations, your committee has been greatly assisted by representatives of the manufacturers of the various parts of the equipment concerned, and it is pleasing for us to report that these recommendations appear to meet with their general approval. In fact they will gladly co-operate in the adoption of these standards, as many of the various manufacturers represented in our conferences have long felt the necessity for the adoption of standards for electric traction equipment. It is possibly well to state that these recommendations are the result of a very thorough and general discussion on the part of all the interests involved, both the manufacturing and various departments of the electric railways. Your committee takes this occasion to acknowledge the very valuable assistance and enthusiastic support of all those who co-operated in the work leading up to these recommendations.

The recommendations of this committee are the result of the labor of two years and we urge that definite action be taken in this matter at your convention this year.

Respectfully submitted,

W. H. EVANS, Chairman,

H. WALLERSTEDT,

J. M. LARNED,

H. B. FLEMING,

R. C. TAYLOR,

H. A. BENEDICT,

H. W. BLAKE,

C. B. FAIRCHILD, JR.,

Committee on Standardization.

BOSTON ELEVATED RAILWAY COMPANY

Charlestown Station

By F. N. BUSHNELL

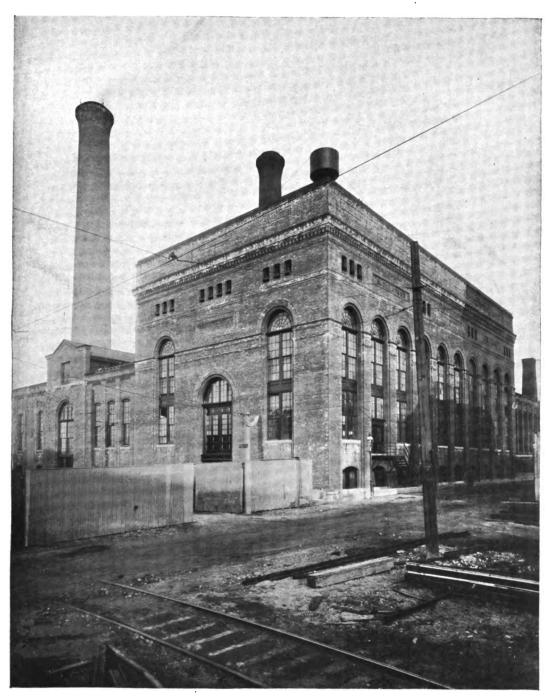
The Charlestown station is located on the southerly side of the Mystic river between Hamblen street and the tracks of the Eastern division of the Boston & Maine R. R., and furnishes power for operating cars in Charlestown, Somerville, Everett and Chelsea.

The original station was built in 1896, and contained two 800 K. W. direct current units driven by 1200 H. P. Allis-Chalmers engines and the necessary boilers, auxiliaries, switchboards, etc. This station was augmented in 1901 by the addition of a building 58 ft. 4 in., by 158 ft, 4 in., and one 2700 K. W. generator direct connected to a 4000 H. P. cross compound Westinghouse Corliss engine, and 2000 H. P. of boilers, so that at the time work on the present extension was commenced the station had a total rated capacity of 4300 K. W.

To enlarge the capacity of this station, it was decided to extend the building 81 ft. 4 in. westerly to provide room for two additional 2700 K. W. generating units and 4800 H. P. of boilers, although only half of this equipment was to be put in at this time, and to build a new chimney of suitable capacity for the completed plant.

The plans also included the construction of intake and overflow tunnels large enough to take care of the condensing water of both the old and new portions of the plant, as the old "suction" intake and the overflow pipes were found to be in very bad condition and would have to be renewed in a very short time anyway.

In addition to the work in the new extension, the railway company desired to have some improvements made in the old plant, with a view of increasing its efficiency and of lessening the risk of damage from fire. These changes included installing new stokers under four of the old boilers, replacing the old motor driven feed pumps by new duplex steam pumps, changing over the feed piping system, removing the Bulkley condenser formerly used in connection with the Westinghouse vertical engine and replacing it with a twin vertical air pump and jet condenser of the same



CHARLESTOWN POWER STATION.

type as installed with the new engine, relocating the switchboard upon a steel and concrete gallery, the construction of a new fireproof floor in place of the wooden floor in the old portion of the building, and changes in the oil filtering and distributing system. All of this work (except installing the stokers under four of the old boilers) has been completed, and the station has been in regular service since October 9 last.

The general design and layout of the building is similar to the old station, the building being of substantial steel and brick construction, and fire-proof throughout. The foundations are of concrete with wide footings resting directly on a bed of hard gravel, except under the chimney and a portion of the north wall of the building, where, on account of an underlying stratum of soft mud or silt, it was necessary to use piles.

The new building is divided by a brick wall into a boiler room 86 ft. 10 in. by 78 ft., and an engine room 65 ft. 10 in. by 78 ft. The boiler room is large enough to accommodate eight 600 H. P. Babcock & Wilcox boilers arranged in two rows, four on each side, with the firing aisle between. Only four of these boilers are included in the present installation, but the chimney and flues are of sufficient area for a future installation of the same capacity.

The boilers were built by the Babcock & Wilcox Company of New York, and are of 600 H. P. each, or a total of 2400 H. P. Each boiler has three 42 in by 20 ft. 4 in. steam and water drums, and 294 4 in by 18 ft. tubes made up of 21 sections of 14 tubes. The front boiler suspensions are supported on the building columns, but the rear suspensions are of the Babcock & Wilcox standard type, and are set entirely independent of the building structure. The boilers are provided with superheaters of the same area and type as those in the Lincoln Station, which are designed to superheat the steam about 50 degrees F. when the plant is running under normal load conditions.

These boilers were built for a working pressure of 200 lbs. per sq. in., and tested after erection under a hydrostatic pressure of 300 lbs. per sq. in. The specifications required the best construction and material to be used throughout, and no cast iron or semisteel was permitted in any part of the work. The headers are of forged steel with internal tube plates, the tubes are of solid drawn seamless steel, and all cross pipes and connections between the drums and the superheater and the superheater and main steam are of open hearth steel.

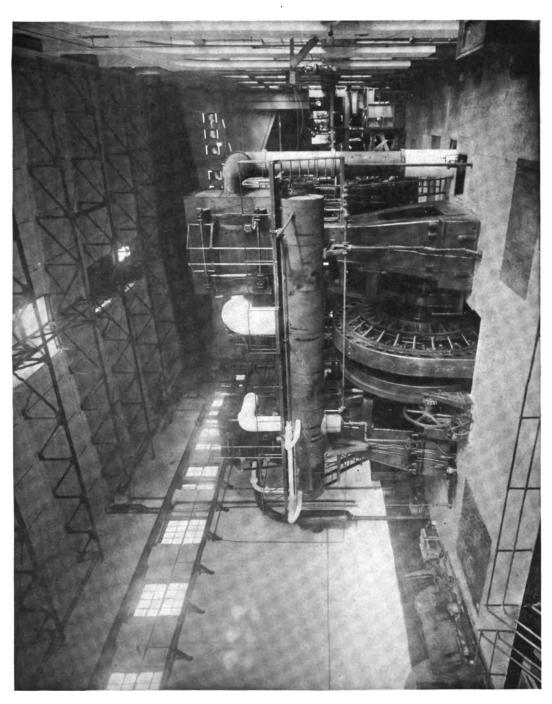
Roney mechanical stokers are used, fitted with the new "Sectional Fin Type Grate" and having 111 sq. ft. of effective grate surface each.

The coal for this plant is delivered direct from the pocket at the Lincoln station or from the storage pile in the yard, as may be desired, to a hopper located outside of the building, from which it is carried by an inclined continuous bucket conveyor to the top of the boiler room, and distributed by a horizontal flight conveyor to the overhead bunker, from which it is fed direct to the stokers. This overhead bunker, which is only intended to hold enough coal to supply the boilers for over a Sunday and two holidays, or for a long enough time to permit of making any necessary repairs to the coal handling and conveying apparatus, has a capacity of 600 tons or 75 tons per boiler.

The feed water is taken from the street mains and heated first by passing it through a primary heater and then through a Cochrane open heater. The primary heater is of the horizontal closed type located in the exhaust pipe between the low pressure cylinder and the condenser, and contains 1055 sq. ft. of heating surface, which is sufficient to heat the feed water to a temperature only 5 degrees lower than the exhaust steam from the engine. From the primary heater the water passes to the Cochrane open heater, where it is heated to a temperature of about 210 degrees F. by the exhaust steam from the auxiliaries before being pumped to the boilers.

Economizers are not used in this plant, as the layout is such that they could not be gotten in without increasing the area of the beiler room, and after careful consideration it was decided that the saving would not be sufficient to justify this additional expense.

The feed water supply to the boilers is controlled by Squires' Automatic Feed Water Regulators, which maintain the water at constant level in the drums, and insure a uniform supply. This device controls the feed valve through pressure exerted on a diaphragm tending to close the valve when the height of water rises above a predetermined level; the pressure on the diaphragm being regulated through a pilot valve actuated by the expansion of a metal "harp" located at the side of the boiler, and at the proper height in respect to the water level to give the maximum expansion or contraction for a given change in the height of the water. To provide against any possibility of flooding the boilers through disarrangement of the controlling devices, alarm water columns



are used to attract the fireman's attention to any change in the water level, when the steam supply can be regulated by a hand operated valve in the same manner as if the automatic device were not attached.

In selecting the boiler feed pumps for these stations, it was decided to have them of uniform size and with all parts interchangeable, so that if necessary an entire pump or any of its parts could be taken from one station to replace similar parts in another. All of the feed pumps were made by the Warren Steam Pump Company, and are of the duplex direct acting outside center packed type, with steam cylinders 14 in. in diameter, water cylinders 19 in. in diameter, and a common stroke of 18 in.

The engine is of the vertical cross compound condensing type, built by McIntosh, Seymour & Co. of Auburn, N. Y., with cylinders 42 in. and 32 in. in diameter by 60 in. stroke, and when running at 90 revolutions per minute with 160 lbs. steam pressure at the throttle, and 26 in. vacuum, has a normal rated capacity of 4100 H. P., and a maximum capacity of 7,080 H. P.

The manufacturers guarantee that the steam consumption per indicated H. P. per hour will not exceed the following when the steam is superheated 50 degrees at the throttle:

1-4 load 12.75 lbs. 1-2 load 12.05 lbs. 3-4 load 12.05 lbs. Full load 12.05 lbs. 1 1-4 load 12.65 lbs. 1 1-2 load 13.85 lbs.

The fly-wheel made up of eight segments is 21 ft. in diameter and weighs 200,000 lbs. The valve gear is of the McIntosh & Seymour standard type, the main steam and exhaust valves being driven by fixed eccentrics, while the steam cut-off is effected by a riding valve controlled by a shaft governor. All valves are of the gridiron type.

The throttle valve made by Schutte & Koerting is provided with a quick closing device actuated by an auxiliary governor, located in the engine fly-wheel, so adjusted that should the speed of the engine increase to about five revolutions above the normal speed, it will engage the tripping device in such a way as to close the throttle valve. This device has been thoroughly tested out since the engine has started, and found to work very satisfactorily.

The condensing apparatus consists of a cone jet condenser in connection with direct acting steam driven twin vertical air pumps built by the Warren Steam Pump Company. The steam cylinders are 16 in. in diameter, the air cylinders 48 in. in diameter, with a common stroke of 24 in. Like the condensers at the Lincoln station, the water end is constructed of bronze throughout to resist the action of the salt water.

New gravity intake and overflow tunnels have been provided for the condensing water for both the new and old portions of the station. These tunnels are 4 ft. in diameter and about 500 feet long. The condensing water is taken from the Mystic river at the easterly side of the company's property, and is discharged into the river at a point about 150 ft. west of the intake, or far enough away so that the hot water from the discharge will not affect the temperature of the water at the point of intake.

A screen well is provided near the outer end of the intake containing a single wide mesh screen intended to prevent any large fish or floating objects from getting into the tunnel, but the finer screens are located in a well near the power station, where they can be conveniently gotten at by the attendants. These screen wells are provided with overhead cranes and chain blocks so that the screens can be easily removed.

A new oil room located just outside of the main power station on the northerly side contains two sets of receiving tanks and filters, either one of which is of ample capacity to take care of the oil for the entire plant. The system employed is the same as that at the Lincoln station described in the last number of the "Public Service Journal." The oil is pumped from the receiving tanks to an overhead tank in the engine room, from which it flows by gravity to the engines and from the engines through the settling tanks and filters to the receiving tanks. It is purposed to run the pumps at a speed sufficient to take care of the maximum requirements of the station, thus keeping the overhead tanks in the engine room always full of oil; the surplus oil overflowing from these tanks direct to the receiving tanks in the oil room. filters and tanks are made of heavy sheet steel, and are of such capacity that the flow of oil through them will be very slow, thus giving an opportunity for the separation of any water which might otherwise be carried through into the system with the oil.

All steam piping throughout the station is of steel with Van Stone joints, and semi-steel flanges and fittings. Long turn bends have been used wherever it was possible to get them in, and the piping has been laid out with a view of making the steam connections as short as possible, while making ample provision for any movement due to expansion or contraction. All feed piping 4 in. in diameter and less, is of extra heavy drawn brass, and above 4 in. in diameter of extra heavy cast iron. All the steam and feed piping was tested to 300 lbs. pressure after erection, and made tight throughout.

The generator manufactured by the General Electric Company, is of the 600 volt direct current compound wound railway type, with its armature mounted on the engine shaft between the high and low pressure cylinders. The chief feature of interest in connection with the generator is the use of commutator inter-poles, this being one of the first applications of this device to large generators. The use of these interpoles permits of sudden changes of load of any amount from zero to the extreme limit of the capacity of the generator, without shifting of the brushes and without serious flashing. These commutating poles have been found to produce these results in a most effective manner, as is shown by the fact that even when running at 50 per cent. overload, the circuit breaker may be tripped without causing the slightest sparking at the brushes. No trouble has been experienced in running this generator in parallel with other generators in the station of the non-interpolar type.

These generators are guaranteed to have a commercial efficiency of:

94 per cent. at 1-2 load,

95 per cent. at 3-4 load,

95.5 per cent. at any point from full load to 50 per cent. overload.

This entire station was completed in exactly eight months from the date of the first contract and seven months and twelve days from the time work was started on the building. It is believed that this establishes a record for rapid power station construction where large engine driven generators are used, and furnishes an excellent illustration of the advantage in point of time to be derived from good team work and from the method of scheduling the work to be done in the office, in the field, and in the shops of the various manufacturers, in use by the Stone & Webster Engineering Corporation, and which will be described in a later number of the Public Service Journal.

EDWARD E. POTTER

The Stone & Webster Management Association congratulate themselves upon the addition to their corps of operators of Mr. Edward E. Potter of New Bedford, Mass., who has been for a number of years the general manager of the Union Street Railway Company of that city, but who has recently been induced to accept the position of assistant manager of The Seattle Electric Company, the duties of which position he assumed about the first of November. The Association is most pleased at the securing of such a skillful and experienced railroad man, and The Seattle Electric Company is to be congratulated on becoming possessed of the services of an able operator as assistant and second to Mr. Grant.

Mr. Potter is a man of middle age and has had very considerable experience in the electric street railroad business, a line of work which he early adopted as one to his liking, and therefore as the one to which he proposed to give special study and effort. He entered Brown University in 1886, and pursuing his studies there for the requisite four years, was graduated with the degree of A. B. To add technical training to the liberal education gained in his collegiate course he took a special course in electrical engineering in the Massachusetts Institute of Technology, spending there the year of 1891, and to further perfect himself in electrical practice, he entered the service of the General Electric Company and was engaged in installing their apparatus in various sections of the country, remaining with that company until 1893.

His first essay in the street railroad world was in 1885, when he entered the employ of what is now known as the Rhode Island Company of Providence, R. I., then the Union Street Railway of that city. Determined to make a thorough study of the business, he worked on the cars, in the shops, on the track and in the power station. In fact, from his first connection with this company he never left its employ until after he had completed his college course. When the Dartmouth & Westport Street Railway

was built he was invited to take charge of that property, and after three months was elected general superintendent of the Union Street Railway of New Bedford, Mass., assuming this position in the year 1894. Under his management and control the tracks of this now prosperous company were entirely rebuilt, power houses constructed and equipped, and the mileage of the road more than doubled. Under his control and in accordance with his plans and supervision interurban lines were built, electric express and freight services inaugurated (the first to be established in Massachusetts), and the companies, which now have about a hundred miles of track, were put upon a most successful basis.

When it was suggested by Stone & Webster to Mr. Potter that he should leave his very pleasant surroundings in New Bedford and become a member of their Management Association with a location in Seattle, the directors of the Union Street Railway protested in strong terms against the severance of relations which had been so fortunate from a business point of view and so pleasant in a social way, but the opportunity of a wider field of effort, coupled with attractions of the Puget Sound district, presented such fascinating possibilities that Mr. Potter felt the invitation was one he could not decline.

We are glad to welcome him to the circle of Stone & Webster workers as one who, we feel sure, will add greatly to our operating strength, and as one association with whom will be in every way pleasant.

SOME DIFFICULTIES IN PARALLEL OPERA-TION

By J. C. WOODSOME.

This article, in which all mathematical discussion has been carefully avoided, is a simple narrative of the difficulties attending the attempts to parallel the alternators at the Houghton power station of the Houghton County Electric Light Company, and of the means by which these troubles were finally surmounted.

The generating equipment of the plant consists of the following units:

One 1500 H. P. Nordberg engine, speed 100 r. p. m., direct connected to a 1000 K. W. G. E. 2300 volt—60 cycle—two-phase generator, type A. Q. B.

One 1000 H. P. Nordberg engine, speed 120 r. p. m., direct connected to a 600 K. W. G. E. 2300 volt—60 cycle—two-phase generator type A. Q. B.

One 250 H. P. Ball engine, speed 600 r. p. m., belted to a 200 K. W. G. E. 2300 volt—60 cycle—two-phase generator, type A. Q. B.

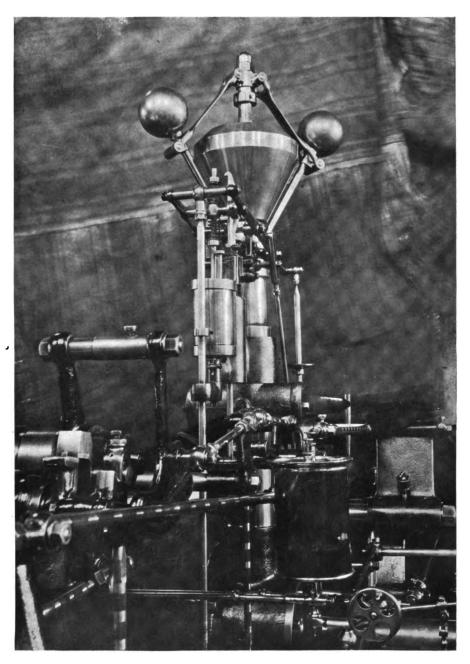
The two Nordberg engines are equipped with similar governors of the weighted, inverted centrifugal ball type.

The weights of the fly wheels of these engines are fifty and twenty-five tons, for the 1500 and 1000 H. P. engines, respectively.

The Ball engine has the usual type of fly-wheel governor used with these engines.

No trouble had ever been experienced in operating the 250 H. P. unit with either of the larger units, due undoubtedly to the fact that this is a belted generator and thus offers a more or less flexible connection when working with the larger machines.

Until recently, however, it was not possible to operate the two large machines in parallel. When this was attempted, immediately upon throwing the machines together, a cross current was established which rapidly built up to such an amount that the



GOVERNOR.

automatic machine switch on the smaller unit would open. This cross current was indicative of a changing phase relation of the current in the two machines. In the study of the source, or sources, of this trouble it was at once concluded, that since the generators were of identically the same design, if they were driven at constant and rated speed their currents would be always in phase. In this case the only source of the cross current could be the difference in voltage of the E. M. F. curves of the two machines. If, however, the E. M. F. curves of the machines were different there would be two surges of the cross current per cycle, or one hundred and twenty surges per second. This was contrary to observations, as the surges were at the rate of about eighty perminute, or one and one-third per second; consequently any difference in wave forms of the two machines was not the cause of the trouble.

The study therefore was devoted almost entirely to the engine end of the units. It was quite evident that there was a lack of uniform angular advance in either one or both of the generators; that is, that the engines failed to produce a uniform rotation of the generators. There might be two reasons for this: First, a sympathetic period of oscillation between both the engine and the generators; second, an improper governing action of the governors.

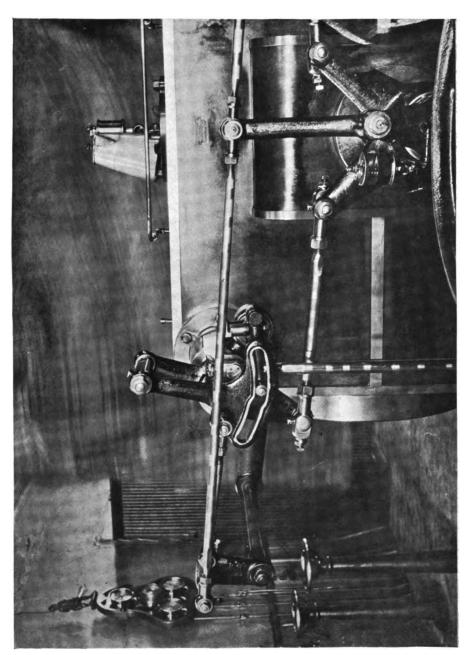
If the first reason were the cause of the trouble, it would probably be possible to correct it by changing the valve setting in such a way as to alter the natural period of the engine. That is, such a source of trouble might exist if the engine imparted either a stronger or weaker impulse from one stroke of the piston, this impulse occurring with the natural period of the generator. By changing the valve setting for this stroke the force and time of the impulse would be somewhat altered and thrown out of harmonic relation with the period of oscillation of the generator. All the valve settings were therefore changed, through reasonable limits, but no improvements in the operation of the machines resulted.

If the second reason were the source of the trouble there might be several causes. With these particular machines in question the trouble originated partly in the mechanisms between the governor and the valves and partly in the governor itself. The valves were operated by the governor through long knock-off rods, and the period of vibration of these rods was a harmonic of the throw of the valves when the engines were running at rated speed. The result was therefore that these rods were in violent vibration. The vibration interfered materially with the action of the governors. The source of trouble was removed by altering the throw of the valve arm and splitting the rods into two sections working through a rocker connection. These changes prevented any vibratory influence getting back to the governor.

It was also found that the governors themselves were a little too sensitive. It was impossible to adjust them to the same degree of sensitiveness so that a change in load on the bus bars would be properly divided on the machines with the same change in speed. The governors were therefore stiffened and made sluggish. The oil in the governor dash-pot was thickened and the spring on the dash-pot piston rod was bridged with a solid clamp. These changes in the governor itself produced the desired results and a change in bus bar load had no appreciable effect in throwing more of the load on either machine than it should take.

In brief, we have climinated a disturbing mechanical vibration acting on the governors and also stiffened up the governors themselves somewhat. The result has been gratifying. The machines now operate together in parallel with very satisfactory action. There still exists a slight cross current, which amounts to about 3 per cent. during rated load, but this produces no noticeable effect on the bus bar voltage. This current is, however, practically constant, so that its influence on the voltage is quite marked when the machines are much under loaded. The units are of such sizes, however, that when these lighter loads are reached the smaller machine is cut out of service and the larger machine then takes all the load. When only one machine is running or when both machines are running independently the bridge clamp on the governor dash-pot piston is removed, thus bringing the governor back almost to its original sensitiveness.

It would seem at this time that everything has been done to improve the working of the machines except what might be accomplished in some changes in the fly-wheels. If the fly-wheels are of such masses that they permit a variation in angular velocity of more than 2 1-2 electrical degrees, with each impulse of the ergine, then there would be difficulty in operating the generators in parallel. The magnitude of the difficulty would depend on the amount of variations. In the case of the machines under consideration, there is probably some variation in angular speed during each revolution where the machines are running light, and there-



fore the fly-wheels are partly responsible for the trouble. But as mentioned above, this is of little moment as long as they work properly together when it is necessary to operate in parallel, and the expense of new fly-wheels or even additional loading of the fly-wheels is not warranted by the improvement to be obtained.

News From The Companies

BELLINGHAM, WASH.

The Whatcom County Railway & Light Company has been making a vigorous campaign during the last eighteen months in the direction of increasing its gas day load. In a preceding number of the "Journal" we ventured to speak of the success which had attended the company's efforts in the matter of electric signs; but lest anyone should be led to believe that the company had devoted itself too exclusively to the electric department of its business, we submit the record of gas stoves in service on September 1 for the last three years, namely:

1905					•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	164
1906																											445
1907																											807

Owing to local conditions in a city like ours, where wages are high and there is such an abundance of wood, to promote the use of gas stoves is difficult. We presume that the figures given above, as compared with the experience of some of the larger gas companies, will not be regarded as anything extraordinary, and we would not have it thought that we were unduly exultant over the result shown; but we make the statement simply to show that we are hard at work and that our efforts are bearing fruit, if not to such an extent as we would like, still enough to encourage us in this line of the company's effort. We are setting the mark for September 1, 1908, at double the number of gas stoves shown as above on September 1, 1907.

(L. H. Bean.)

BROCKTON, MASS.

At the convention of the National Boot and Shoe Workers' Union recently held at Toronto, the Brockton candidate for president of the association was defeated. This resulted in the defeated candidate forming a new association of the major portion of the lasters in the city of Brockton, the members of the new association seceding from the Boot and Shoe Workers' Union, with which the Douglas company had a contract expiring some-

thing like a year from date. The demands of the new association to be recognized were not allowed; consequently the lasters struck. As the Douglas company was under contract with the old association it immediately informed the new association that the Douglas Co. would stand by its agreements. The old Boot and Shoe Workers' Union helped to fill the places of the strikers with new men who were members in good standing of the Boot and Shoe Workers' Union. The members of the new association were out some time, but found that no support would be given them by the other shoe working unions. As a consequence, most of the striking lasters have rejoined the old Boot and Shoe Workers' Union and returned to work, thereby causing the revolt to fall flat, with but little interruption to ordinary business. It seems fair to assume that it will be some time before another attempt is made in Brockton to break written and well understood agreements.

Figures furnished by the inspector of buildings show that Brockton still continues to grow at a rapid rate. Permits for new buildings aggregating \$248,125 were granted during the month of September, which shows an increase of \$104,774 over September of last year. The erection of three large buildings was started during the month of September—one office building and two theatres—in addition to apartment houses providing for 43 additional tenements.

Shoe shipments for the nine months ending September 30 have been 636,924 cases, as compared with 601,000 cases for the corresponding period of last year.

The coal teamsters are again to ask for an increase of wages on January 1. They are now receiving \$2.37 1-2 per day of 8 hours, and are demanding \$2.50 per day, which rate was refused a year ago.

Peritonitis, induced by an accidental blow on the stomach, brought about the death of William Clark, an employe of Westinghouse, Church, Kerr & Company. Mr. Clark was employed in connection with the work at the new East Bridgewater Station.

C. Smith, cashier of the Brockton Edison Company has returned from the recent convention of the American Interurban Street Railway Accountants' Association at Atlantic City, and reports a profitable and interesting meeting.

One hundred and fifty thousand people attended the great and only Brockton Fair recently held in this city.

The new Edison Brockton 3,000 K. W. turbine station at East

Bridgewater is rapidly approaching completion, and will soon be delivering current to the sub-station at Brockton. This much needed new supply will enable the company to push its power business and further extend business in other fields. The new underground system is practically completed, including the high tension system from the sub-station at the old plant to the terminal of the overhead transmission line, where the two triplex 25,000 volt underground cables connect with the duplicate overhead line running on private right of way from East Bridgewater to this point.

CHASE-SHAWMUT COMPANY.

- P. H. McGrath has recently left to accept a position with The Minneapolis General Electric Company.
- A. W. Shaw, who has been conducting experimental work for us the past year, is now in the statistical department in the Boston Office.

COLUMBUS, GEORGIA.

Columbus, the county seat of Muscogee County, Georgia, is situated at the Coweta Falls, on the Chattahoochee River, at the head of navigation, 360 miles from the Gulf of Mexico, 125 miles southwest of Atlanta, 300 miles directly across the state from Savannah and 158 miles from Birmingham, Ala., the centre of the coal and iron and steel industries of that state. The city is situated in the pine forest district, with sandy soil. There are no swamps nearby, malaria is not known, and the swift flowing river provides ample drainage. There are three railroads radiating from the city in seven directions: The Central of Georgia, the Seaboard Air Line, and the Southern Railway. In addition to these, the Georgia, Florida & Alabama and the Columbus & St. Andrews Bay are being built. There is also a dummy freight line in the city delivering goods to warehouses and stores. In all, they handle a yearly freight business of \$935,000, and passenger ticket sales amount to \$270,000.

The chief industry of the city is cotton manufacturing. There are ten corporations engaged in this business, having an aggregate capital and surplus of \$5,000,000, operating 199,528 spindles and 4237 looms, employing 4500 operatives with a weekly payroll of \$27,000.00—an average weekly wage of \$6 per operative, and a product valued at \$7,000,000. These mills use 55,000 bales of cotton per year, all of which is Georgia and Alabama cotton bought

in the local market, with the exception of 3,000 bales of Egyptian and Sea Island cotton. The total cotton receipts at Columbus for the year ending September 1, 1906, were 225,000 bales.

Columbus has, in addition to these, large cotton seed oil mills, fertilizer factories, iron works and foundries, three cotton compressors, four ice factories, plough factories, a cotton gin factory, two large show-case factories, wagon and buggy factories, and three hosiery mills, together with other minor industries. The manufactured products are valued at \$10,300,000.

The city has an abundance of power at low rates. The Columbus Power Company has obtained control of the river for miles above Columbus, which will enable it to develop 75,000 H. P.

The population of the city is as follows:

1880 Census	 10,123
1890 Census	 17,303
1900 Census	 17,614
1906 Census	 *38.415

The Post Office receipts for the year ending Dec. 21, 1906, were \$54,994.94, and the bank clearing for the same period was \$17,448,845.

The city has three national banks, with a combined capital of \$550,000 and gross deposits of \$1,500,000, and four state banks, with \$475,000 capital and \$1,407,000 gross deposits.

The assessed value of property in Columbus January 1, 1907, was \$17,000,000; the bonding capacity of the city is \$1,190,000, bonds issued \$512,000, and a floating debt of \$51,000.

EL PASO, TEX.

To take care of the increased load of the El Paso Electric Railway Company, the Stone & Webster Engineering Corporation has ordered a new 520 H. P. A. & T. boiler for delivery on November 10, 1907. This additional capacity will place the company in a comfortable condition, so far as available capacity is concerned, for the next six months.

On October 3, 1907, Mr. C. H. Courser was succeeded as chief engineer of the company by Mr. George D. Hettrick. Mr. Hettrick came to us from the Iowa & Illinois Railroad Company of Clinton, Iowa, but it is in reality returning to the fold where he belongs, as he was heretofore with the Stone & Webster Company at Houghton, Michigan.

^{*}Including Columbus and suburbs.

By deed from the International Water Company in the latter part of September, this company acquired its final title to about 170,000 square feet of land on the Rio Grande for a new power station site. The present power station location at the corner of Fourth and Santa Fe Streets is now entirely outgrown and a new and larger space is very much needed. The Stone & Webster Engineering Corporation has estimated that the new power station site allove mentioned will be large enough to accommodate a power station sufficient for the needs of a city of 200,000 inhabitants, which shows that Stone & Webster appreciate what a large city El Paso is sure to become and are looking ahead into the future.

The appearance of Ringling Brothers' circus in town on October 5 gave this company the opportunity to establish a new record for daily railway receipts. On that day 42,260 passengers were rung up on our registers and the earnings for the day were \$1,624.10.

One of the recent indications of El Paso's rapid growth is the latest report of the El Paso postmaster, which shows an increase of 28 per cent. in 1907 in the receipts of the post office over the figures for the preceding year. In this connection a few figures of the growth of the El Paso Electric Railway Company since it started business in 1902 will doubtless be of interest.

•	1902.		1907.
Cars owned	12		46
Miles of track	13		26
Car miles run per annum	330,000		1,000,000
Employes	78		166
Lighting customers	705		8,500
Connected lighting load	580	K.W.	4,000 K.W.
Capacity of power station.	1,050	H.P.	3,150 H.P.
No, city are lamps	150		214

Mr. Eliot Wadsworth of the Boston office visited us on the 16th of October and spent the day in looking around town. Mr. Wadsworth was active in organizing the El Paso Company during the latter part of 1901 and the early part of 1902 and was therefore thoroughly familiar with the conditions which existed during the organization days. He expressed himself as almost dumfounded at the extraordinary progress El Paso has made since his residence here in 1902.

During the month of October we received four 15 bench Narragansett type open cars, manufactured by the J. G. Brill Company. These cars are each equipped with two Brill 27 G-1 trucks and with G. E. 81 30 H. P. 4 motor equipments and Westinghouse straight air brakes. This makes the total number of cars owned by the company at the present time, forty-six.

On the 15th inst. a very interesting innovation was tried under the auspices of the Chamber of Commerce in the holding of a socalled "Get Together Dinner," to which were invited all the prominent business men of the city of El Paso. Three hundred and fifty-four sat down at the banquet and the enthusiasm displayed through the entire evening was strong and hearty. Fourteen toasts were delivered, touching on the manifold activity of El Paso and contrasting its past with its present condition. Several speakers alluded emphatically to the large share in the city's growth which was attributable to the transportation facilities furnished by the El Paso Electric Railway Company. The speaking lasted until three o'clock in the morning, but so ardent were the persons present at the banquet, and so interesting and varied the topics presented, that the interest did not flag at any stage of the program, and we carried a car load of people home on every line after the banquet.

The city of El Paso has recently inaugurated a new system of valuations for the purpose of reducing the tax rate of the city. The present tax rate is nearly 3 per cent. for city, county and state taxes, but this is almost entirely due to the very low valuations upon which the tax rate has been based in the past. The city council, feeling that the high rate proves more or less of a factor in preventing prospective residents from settling in El Paso, has very wisely raised the valuations all over the city up to within about 60 per cent. of their market value, and it is expected in this way to decrease the tax rate for city, county and state taxes to about 2 per cent. The funded debt of the city of El Paso is, as a matter of fact, not large in proportion to the city's population, being at the present time about \$500,000.

(C. W. Kellogg, Jr.)

GALVESTON, TEXAS.

Galveston occupies the unique position of being both an important seaport and a seaside pleasure resort, all within the city limits. On the Bay side of the city are unparalleled wharf, dock and shipping facilities only five miles from the deep water of the Gulf of Mexico, and with a deep and safe channel and with a land-locked harbor.

On the Gulf side of the city is a magnificent broad beach of

fine hard sand with perfectly safe bathing, free from dangerous fish or bad undertow. This beach extends uninterruptedly for thirty miles down the island, and is so hard that a horse's hoof makes little impression on it. It is ordinarily so smooth that a speed of sixty miles per hour can be made over it with automobiles; and when at its best, a hundred miles an hour can be made with an automobile with perfect safety and comfort.

Running westward between the island and the mainland is the "West" Bay from two to five miles wide, and projecting into the mainland to the Northeast is the "East" or "Galveston" Bay proper, thirty to forty miles wide and receiving the waters of the Trinity and the San Jacinto rivers and of Buffalo Bayou and smaller streams. In summer both these bays are alive with fish, and in them and at the jetties of the harbor may be and are caught speckled sea-trout, red-fish, Spanish mackerel, pompano, sheepshead, jew-fish, blue-fish, drum, flounders and all the small edible fish, such as "croakers," sand-trout, etc. To those who desire big fishing there are plenty of tarpon, jack-fish, king-fish, etc., with a chance of a shark, a sword-fish or a ray-fish—any of them weighing from fifty to two hundred pounds. Also the bays, the bayous and the small salt inlets are floored with oysters large in size and fine in flavor, while the waters teem with crabs and fish.

In winter, all these waters swarm with game: wild swans, geese, brant, duck and snipe; while on the shore adjacent are plover, quail, and all the wading birds; and, in the marsh and timber land around the rivers, are squirrels, coons, 'possum, rabbits (both "jack" and "cotton-tail"), foxes, and all small "varmints," and if one wants a little spice of danger and cares to go into the deep thickets and cane-brakes, he can find wild-cats, alligators, bears and wolves.

Such a combination in and close around a lively modern city, with all the "modern improvements," makes it an ideal pleasure resort, and to this fact Galveston is again waking up. Before the great storm of 1900 its beach was fast becoming favorably known; but the storm put an end to that for the time being, as the people were too busy rehabilitating their city as a home and a port, and protecting it from a repetition of the damage of 1900, to pay much attention to its pleasure attracting aspect.

One man, however, had faith in this part of it and also the courage of his convictions, and with a small sum of his own and some borrowed outside capital he built a large, commodious and

well-kept bath-house on the Gulf beach and at once proceeded to make money. No one else was courageous enough to do anything towards making the beach attractive or advertising its beauties and pleasures until 1904. At that time the writer took charge of these properties—then the Galveston City Railway Company—and immediately made arrangements with the bath-house to build a bandstand on the shore side of it and to give there free band concerts. Two or three hundred comfortable benches with backs to them were made and placed on the beach in front of the band-stand, a local band of sixteen to eighteen pieces was obtained, and afternoon and evening concerts given on Tuesdays, Fridays and Sundays. The effect on travel was instantaneous, and the cash results, as against the previous year, showed a net profit over all expenses and expenditures.

In the winter of that year the steam railroads running into Galveston were all approached and urged to run regular excursions into Galveston during the summer, the promise being given by the Railway Company that it would not only continue its band concerts but would give other attractions whenever an excursion was run. The railroads consented to try it, and the Street Railway Company promptly hired a fire-works and attraction man and during the summer gave, besides its concerts, fireworks displays, balloon ascensions, high diving, etc., etc. The steam railroads and the thirty or forty thousand excursionists who came here were well pleased, and the cash balance for the season was again "to the good!"

In addition to this the railway had guaranteed the expenses of several special "conventions," and had worked up several other "events" which brought excursions—and extra car fares—and which left many dollars in the city. It had also, in conjunction with the "Galveston Business League"—the main commercial body of the city—installed and perfected an "Information and Comfort Bureau" at the Union Depot where visitors and excursionists could be supplied with information as to the objects of interest, comfort and pleasure in the city, and where arrangements could be made for lodgings and meals to suit all purses. A house-to-house canvass of the city had been made, and every person who would serve a meal or furnish beds or rooms had been listed with all details, and the lists mapped out on a form in such a way as to give instant information to any inquiry regarding accommodations. Boys, in uniform cap, were employed to guide the parties as they

went out, and arrangements had been made with the hack-men for a minimum charge per person to all parts of the city. Personal attention was given to this matter by the Railway Company and the League with the result that, in one night between the hours of ten and two in the morning, over five thousand excursionists were satisfactorily housed. This and the fulfillment of the "attraction" promise by the Railway Company meant pleased and satisfied excursionists and a "come again"; it also meant pleased steam railroads and more and larger excursions promised. The expense of the Information Bureau, etc., was guaranteed by the Railway Company, but the latter was called on to pay but little on these items, as a small pocket "folder" was issued and handed out on the trains and given to each excursionist and the local advertising of hotels, fishing-piers, excursion-boats, etc., in it paid all these expenses. This folder gave the names and locations of all hotels, boarding houses, objects of interest, pleasure points and attractions, and what street car lines they were on and just which cars to take to see them.

In consequence of the success of the season of 1905 public interest was aroused and capital interested, and in the spring of 1906 another large, handsome and commodious bath house was erected on the beach, and an "Electric Park" with all the modern pleasure-park attractions was projected close to the beach.

In May, 1905, the Railway Company passed under the management of Stone & Webster who immediately began a reconstruction of the physical part of the property and who also followed and amplified the liberal public policy of the City Railway Company. As the necessity of the previous band concerts and attractions would be taken away by the proper operation of the Electric Park and as the promoters of the Park expected to put a great deal of money and risk into it, it was agreed that the Railway Company would furnish for the season of 1906, from its illuminating department, current—at a certain fixed price—in amount equal in dollars and cents to what it had spent in concerts and attractions the previous season. This was on the understanding that the Park Company would agree to give daily concerts and special attractions on Sundays and on all days when "events" or excursions were in the city. The offer of the Railway Company decided the matter of the Park, and a very complete and most beautifully illuminated "White City" arose at once on the Beach for the season of 1906. The steam roads increased the excursions and the liberality of the

excursion rates and time limits, the number of excursionists greatly increased as did their quality and the length of their stay in the city. Every line of business felt the benefit of the influx of visitors—the Railway Company along with them.

The season of 1907, just closed, shows even better results. Another pleasure park was started, several "summer hotels" and several more "all-the-year-round" hotels were built or started, "curio" and "souvenir" stores multiplied, and every branch of business in the city felt the beneficial effects of the excursionists. These, from May 1 to October 1, 1907, amounted to something over 100,000 actual count arriving at the Union Depot as excursionists, the depot-master having kept accurate account of all this excursion business. This does not include those who come to the city, for pleasure, on regular trains, nor those who come here to take the steamers abroad or the various coast lines, and who now always arrange to spend a few days to a few weeks in the city "on pleasure bent" before they take their ship. Neither does it include the many commercial travellers who spend their "weeksends" here, nor the "honey-mooners" who are making Galveston the "Niagara Falls" of the Southwest in that respect. Neither does it include those who come here in winter to enjoy the bathing, the beach, the hunting and fishing, and the warm climate from October to May. All these—outside of the summer excursionists-amount to from fifteen to twenty thousand more "pleasure" visitors in the course of the year.

Now as to the results started by a bath house, a small band and a few benches—it is a very conservative estimate to say that each excursionist and visitor spends at least \$4.00 apiece while in the city (they really spend more—fully half as much more, but we'll let it go at four dollars). That means \$500,000 as a minimum that will have been spent in the city by outside parties during 1907, and most of this money is spent on things which turn that money direct into the retail stores, the private families and the working man and woman, and also into things-both material and labor-in which there is a good profit. Its immediate effect is a healthy stimulation of all small businesses and of the large ones also, as many excursionists combine business with pleasure and buy largely of the large and wholesale stores while here. Its indirect and slower effect is to advertise the city in every portion of the Southwest and West by word of mouth, for our excursionists come to us this year not only from Texas but from all the surrounding states and territories. This, eventually, means more than the mere dollars each year, for a widespread, favorable, personal advertisement of a city means more settlers, more capital and more prosperity. The reflex action of this excursion revenue is easily apparent within the past four years; there are more stores and better stores, more and better goods are kept and sold, hotel facilities have increased and improved, private and municipal improvements have been initiated and pushed to completion as they would not have been but for the stimulus of this business, all public facilities have felt that stimulus and increased their facilities, the steam roads, the street railway, the livery stables, the excursion boats, the restaurants and hotels have all been pushed to keep up with their increased business and have met the sudden occasion remarkably well.

For the street railway it has meant much increase of both investment, operating and accident risk, but it has also meant increased revenue in nearly a proportion. All the visitors take at least two rides on the street cars—to the beaches and from them -and many seem to ride the whole time that they are not in or on the water. It means, of course, "rush traffic" of the "rushiest" kind, when equipment is pushed to its limit and everyone, from the track greaser to the manager is "humping" from early morning until the last car is in for the night. It means extra "eternal vigilance" in every department, for a pleasure crowd is a heedless and impatient crowd, but, if properly handled, it means more gross revenue without a full equivalent ratio of expenses, and that is the business that the small and medium sized roads must look to for their net profits, for, under the increase of prices of labor and materials and the increase of taxes and municipal exactions and damage claims, the fare remains the same or lessens, as special transfer privileges or special ticket-rates are made and the "regular rider" does not pay expenses and interest in the smaller cities. For the profit, "stimulated traffic" must be looked to and, if the facilities for much traffic are present—even in embryo-they must be exploited; if there are none, they must be created. But they must be both exploited and created with a cautious hand, for "stimulated traffic," especially "pleasure" traffic, is an uncertain quantity; bad weather, epidemics, bad crops, stringent money, dull times, elections and sudden counter-attractions in other localities, all tend to lessen that traffic, sometimes to the vanishing point, while the "stimulus" keeps on at the same old gait, eating up expenses and manufacturing depreciation at the expense of the railway company. Festina lente must be the motto in "stimulating" traffic; but when that traffic does not come, then "Festina" for all you are worth—for of all fares the stimulated one is the most elusive.

(H. S. Cooper.)

HOUGHTON COUNTY, MICH.

The stringency in the money market, which seems to have been brought about largely by the lack of confidence on the part of investors, and the condition that results from this, namely, that electric lighting and traction companies are unable to finance work of construction and improvements, has resulted in a very sudden falling off in the demand for copper. This falling off has been so unexpected and acute that the Lake Superior mines, as well as the mines in Montana and Arizona, have been caught with large supplies of copper on hand. The price of the metal has fallen rapidly from 25 cents a pound to about 13 cents a pound, a decline of fifty per cent. in a few months. It may be said in general that the mines of the Lake Superior district can produce copper at a lower cost per pound than the mines of any other district, and that the decrease in the price of copper will not so materially affect the prosperity of this region as it has already affected that of Butte, where the amount of copper ore going to the smelters is just ten per cent. of what it was a few months ago. It is nevertheless true that there are many Lake mines now operating in which the cost of production is relatively high, and which would suffer losses in proportion to their output on a metal market of 13 cents. It will naturally result from this that the output of these mines will be restricted, and probably in a few cases cut off altogether, but the point which is of most value to those people who are interested in business in the Copper Country of Michigan is that the percentage of reduction in output of the Lake mines, and consequently the number of men discharged from employment and the amount of money withdrawn from the payrolls of the mining companies and distributed in the district, will be less than in any other copper camp. on account of the low average cost of production of copper and the absolute necessity of keeping these tremendously large and deep mines open and free from water. We have already begun to feel here the effect of the low metal market. Hundreds of men have come here looking for employment, and unless conditions improve the business of the community may be seriously handicapped; but

we may in any case console ourselves with the knowledge of the fact, that if conditions are bad here they must at least be better than in any other copper camp, on account of the natural conditions surrounding the production of the Lake mines.

(W. H. McGrath.)

The village council of Houghton has requested the Electric Light Company to install twelve series Nernst lamps for street lighting on College Avenue in East Houghton. The company, several weeks ago, put up a few lamps for demonstration purposes, which proved very satisfactory in every way. One evening a special car was provided for the councils of Laurium and Hancock to go on a junket to Houghton to observe the illuminating qualities of the Nernst lamps. The towns of Hancock and Laurium are contemplating installing additional street lamps.

The Houghton County Agricultural Society held its fifth annual fair at the Amphidrome, Houghton, September 24 to 28. At the beginning of the week weather conditions were such as to cause some fear that the attendance would be small, yet Wednesday morning opened up bright and warm, and the weather man certainly favored the Society for the balance of the week. As a result, the attendance this year was greater than any year previous. The number and quality of the farm exhibits also showed a marked improvement over previous years, which goes to show that the Copper Country is making rapid strides along agricultural lines. Our company rented space for advertising purposes in the Amphidrome proper, and under the direction of the contract department demonstrated to the thousands of visitors at the fair the many domestic uses to which electricity can be applied in the home. We did not expect to receive any prize, yet our booth was so neatly arranged that we were awarded second premium. We believe this medium of advertising has been a great help to the contract department in placing electrical heating and other devices in the homes of Houghton County.

(F. G. Bolton.)

The railway has just completed an inspection of its trestles preparatory to the winter season. A person riding over our road for the first time is particulally impressed by the number of trestles we have. There are seven of them, built at the various points where the line crosses over the railroads to the mine locations along the way.

The construction work at the Houghton station is nearing

completion. It is now expected to have the turbine running not later than December 1st.

The Electric Light Company is negotiating with the Van Orden Company of Houghton for handling and storing the Light Company's coal, external to the Houghton plant property. The storage yard at the power station has become inadequate for the needs of the company, and as a sufficient and economical means of handling and storing coal at the station would require a tremendous outlay of money, it is proposed to store the coal externally and deliver it at the station in bottom dump cars.

The engineering department has recently completed a detailed set of maps of the distributing system of the lighting company, showing the location of poles, lines, transformers and arc lamps in the various towns and mine locations served by the company.

We have had our first fall of snow. On September twenty-fifth in Calumet it snowed for a greater part of the morning, although the snow melted as fast as it fell.

A narrow gauge track is being laid from the boiler-room to the coal pile at the Hancock plant for hauling coal into the boiler-room.

An addition has been built on to the Laurium car-barn for salt bins and salt storage room.

Everyone has heard the story of the cow which stopped the train, and how the train caught up with her again. Well, here is the companion story, only this time it is about a horse and an electric car. The other afternoon one of our cars (in this case, unlike the train, the car was running at greatly reduced speed) chased a horse along a stretch of the interurban line. The horse absolutely refused to get off the track and appeared much annoyed that the car should persist in following him. Finally he allowed the car to approach very near, with much ringing of gong and tooting of whistle, then with a sudden whirl he delivered both hind feet squarely into the headlight, and with a snort and a bound cleared the fence and disappeared into the woods.

MINNEAPOLIS.

Mr. R. H. McGrath comes to us from the Chase-Shawmut Co. of Newburyport and will have charge of the Statistical Department.

Mr. Leonard and Mr. Gille made a hurried trip to Duluth the week of Oct. 21st.

Mr. M. M. Phinney, District Manager of the Texas properties was here for a few days Oct. 12th.

Mr. G. E. Tripp, of the Boston office, was in Minneapolis for a week Oct. 9th.

Mr. Howard F. Grant, District Manager of the Puget Sound companies, stopped off for part of a day on his way home from Boston.

Assistant Treasurer H. B. Sewall has just returned from a visit to the Boston office.

Mr. H. K. Silsbee, of El Paso, was greeting old friends on his way home from the meeting of Assistant Treasurers in Boston. He looks as though the hot climate agreed with him.

The Contract Department is now nicely located in the commodious new office on the second floor.

The Heating and Advertising Department has vacated the small store where it has been for the past two years and are gradually getting settled in the space left by the Contract Department.

The terminal pole at the west end of the Tenth Ave. South Bridge, across which our feeders come, was damaged by a fire last week, cutting the whole south side out for half a day.

Mr. R. W. Clark has just come from Fargo, North Dakota, to take up the work of sign, window and display lighting.

Ducks are reported very plentiful in Minnesota this season, although it has been noted the flight has materially diminished after each trip made by Mr. Leonard, and no small number has been distributed through his generosity.

PLYMOUTH, MASS.

Last August the Brockton & Plymouth Street Railway Company closed a contract with the Plymouth Electric Light Company which provides that the former shall supply all the direct current day load for the latter company between 6.30 A. M. and 6.00 P. M., except on Saturday, when current shall not be furnished after 12.00 noon, and on Sundays and holidays, when no current shall be furnished.

To handle this load the railway company has installed a new switch board panel, including a G. E. wattmeter of the very latest design, Type E, 800 amperes, 550 volts. The wiring is so arranged that current may be supplied the lighting company from either of the D. C. generators, or from the rotary, and in no case will the current supply come from a grounded circuit. All the current is carried to the power station of the Electric Light Company and distributed on its switch board.

The load was taken over by the Railway Company on October 11 and since then has averaged about 1100 Kwh. per day. This is greater than the minimum load guaranteed and will probably be increased in the near future.

Messrs. Warren and Chase attended the Street Railway Convention in Atlantic City during the week of October 14. They report a very successful convention and a pleasant and instructive visit.

On October 20, Luther S. Whittemore, for eleven years conductor on the Plymouth road, died from injuries received in an accident the day previous. The death cast a gloom over all the employes and officers of the company, among whom Mr. Whittemore was very popular. He was a man of most exemplary character who met every situation in life with a cheery, winning smile that made him friends by scores. He was always courteous and helpful to women and children, and was especially noted for this trait. To do his work well seemed his only object, and he succeeded. He will be greatly missed by all with whom he has come in contact, and his place will never be wholly filled.

The Pilgrim Hotel closed on September 5, after the most successful season in its history. It was filled to its capacity throughout the season, and on Sundays the influx of automobilists taxed even the new dining room. Several golf tournaments were run during the season and all were successful, with large numbers of players and excellent playing. The links are still open, and will be kept in condition until snow flies for the benefit of local players.

For three years and more Plymouth has been agitated and divided over the question of the "Main Street Extension," a proposition to connect the centre and south ends of the town by a direct and wide roadway, where now there is only a narrow, circuitous connection. Two boards of selectmen have refused to lay out the extension, and appeal was taken to the county commissioners, who finally laid out the road. The town then elected a committee with full powers to act and appropriated \$45,000 for building the road. This committee has purchased land and let the necessary contracts for a 50 foot street about 1000 feet long, with a sidewalk on the easterly side only, and for a 40 foot span reinforced concrete bridge over Town Brook. Work has commenced on the bridge

and fill, and the contracts call for completion of the roadway early next spring. It is expected that the Brockton & Plymouth will lay a single track over this new street, abandoning the use of the present track for regular service. This will eliminate three bad curves, shorten running time by two minutes, and given an easier grade.

PONCE, PORTO RICO.

The Ponce Railway & Light Company is now in the midst of the rainy season. Nearly every day it rains some, and now and then all day and all night there is simply a succession of showers. Freshets follow one another down the river and the water is full of red mud. This is pretty hard on boilers and condensers, but we cannot avoid it.

Naturally, the railway business is poor as a result of the rains; and so is the lighting business, as every one seems to go to bed early during rainy weather, permitting us to shut down one engine at least a half hour earlier than in fine weather.

Trackwork and boiler foundations must go forward in spite of the rains, but it is not easy to persuade the men to keep at it any length of time.

Our new boiler is being hauled up from the Playa and the foundations will soon be ready to receive it, so the work should go forward rapidly unless the rains are too frequent and severe.

SAVANNAH, GA.

(H. S. W.)

Our city lighting contract expires December 31, 1907. Proposals for lighting the city after that date were called for on October 15. Because of severe competition in the lighting field, offered by the Savannah Lighting Company, which began business last December, it was imperative that we retain the city lighting business. The new contract has been awarded to us for a period of two years, in spite of the other company's being more closely allied than ourselves to the present political party in power. This result has been attained through the closest kind of co-operation between President George J. Baldwin, who had the local organization behind him, and Mr. C. F. Wallace, who called in Messrs. Blood and Philip of the Boston office. This victory emphasizes the old Stone & Webster slogan that "brains and good team play will win every time."

Mr. H. H. Hunt, district manager, returned from his vacation early in October.

R. H. Eaton, assistant treasurer, attended the recent Street Railway Convention at Atlantic City and also the meeting of assistant treasurers at Boston. He afterwards enjoyed a few weeks' vacation at his home in Fayetteville, N. Y.

Our show windows were particularly attractive the last week in October. It was the appropriate time for a Hallowe'en window, and the idea was very cleverly carried out with corn stalks, sugar cane, pumpkins of all sizes and shapes, and vines. The pumpkins were scooped out and were made into grotesque Jack-o'-lanterns, and the effect was made more weird by the use of "skedoodle" lights inside of the heads. Some of the heads were decorated with a feather or two, while others were content to smoke big corn-cob pipes with long curved stems. It was an amusing sight to see the children gathered around this quaint window display. It was an idea that "caught on" with the young and the old.

Extensive improvements have been made in the tracks since the arrival of G. W. Rounds, assistant superintendent.

Assistant Superintendent Rounds is giving a great deal of attention to the reorganizing of the street railway department and is being ably assisted by H. L. Stanley, who was transferred from the Tampa Electric Co. and who has been appointed superintendent of transportation.

The number of street car accidents in Savannah has been rather high in the past. Mr. Rounds is using every effort to minimize these by giving much attention to the proper training of the men who operate the cars. In this work he is being ably assisted by E. W. O'Connor of the claim department, it being realized in Savannah that the only proper way to handle accidents on the railroad is through the closest sort of co-operation between the heads of the transportation and claim departments.

Early in October, several New York and Boston newspaper men were the guests of the city and the Ocean S. S. Co., Savannah Line, on the occasion of the initial trip of the beautiful new boat, "City of Savannah." which is to ply between this port and New York. It was one long round of pleasure for the visitors, and the Savannah Electric Co. is responsible for a big portion of the good time.

The winter advertising campaign is on in full force, vigorous work having been commenced the latter part of October. The newspaper advertising was begun with a series of "Little Lessons in Electricity," the idea being to give the public a better knowledge

of the every day electrical apparatus and appliances, with arguments as to why electricity should be used. A very complete mail solicitation campaign is also being waged with present customers, prospective residence customers, and aign and power prospects.

SEATTLE, WASHINGTON.

The weather in the Puget Sound country has continued cool up to this writing, and we have had many mornings and evenings of dense fog. This latter has been especially trying on the operating forces, because of the danger of accident or collision; but fortunately, no serious accident has occurred from this cause on any of the Puget Sound properties.

The writer spent nearly the whole month of September at the home office and thereabouts, going over with the principals and sponsors many important matters in connection with the development and operation of the companies located in the state of Washington. His visit was made pleasant by the many courtesies extended, and while it was with regret that he departed for his home, there was a considerable element of pleasure in coming back to this country, where men talk very little of "tight money," or prognosticate "hard times" in the near future. The crops throughout the Northwest have been most excellent, both in quality and quantity, and the prices prevailing for wheat, oats and the many varieties of fruits raised on our irrigated lands, have been of a character to satisfy the growers, and the great bulk of those crops are now taxing the transportation companies to their utmost in their endeavor to get them to market.

The bank deposits in all the cities of the Sound country are steadily increasing, and many new enterprises are being developed. The business of all our companies, while showing some falling off from the unprecedented gain of the summer months, has continued good and satisfactory. The many improvements which have been undertaken by the various companies during the present season are now approaching completion, but owing to the unprecedented growth of population, no let-up can be counted on along the necessities which our enterprises will be called upon to provide.

One favorable feature is developing, owing to the financial stringency in the East and Middle West, and the consequent letting-off of thousands of employes, and that is that many competent mechanics and others are coming to the Coast seeking a bettering of their condition. Labor is becoming more plentiful. This condition has further been accentuated by the fact that the transcontinental lines gave notice some weeks ago of a raise in the rate on rail shipments on lumber East-bound to Missouri and Mississippi River points. The lumber manufacturers and shingle mill men are hard at work contesting the propriety or necessity of this raise, and in the meantime have very considerably curtailed their manufactured output. This has thrown a considerable number of employes into the labor market.

Civic activities in the way of street improvements, municipal buildings, water-works extensions, etc., are as large as they have been in the past, and there seems to be no let-up along these lines.

We have been enjoying a visit from Mr. Harold Peabody, of Lee, Higginson & Co., who is taking his first trip to the Pacific Coast, and the writer feels that he has been much impressed with what he has seen.

The general superintendent of The Seattle Electric Company, Mr. J. B. Lukes, the assistant treasurer, Mr. Frank Dabney, and the manager of the Puget Sound Electric Railway and the Tacoma Railway and Power Company, Mr. W. S. Dimmock, are absent attending the Convention of the American Street and Interurban Railway Association at Atlantic City, and at this writing are in Roston, going over matters pertaining to their various companies. Mr. J. C. Hector, assistant treasurer of the Whatcom County Railway and Light Company, has also made the trip.

Mr. Jacob Furth, president of The Seattle Electric Company and the Puget Sound Electric Railway, went to New York and Boston early in October, to meet his daughter and grandchildren on their arrival from Europe, and he will pass some time in Boston going over business matters with our principals.

The Everett Railway, Light and Power Company, which was taken over by the Stone & Webster interests on September 1, is at present without a manager, but it is expected that the "man for the place" will be selected and installed by November 1. All matters in connection with this company are being cared for by the district office, through Mr. L. S. Duryee of Everett, who was associated with the owners of the property and who kindly consented to act as the company's managing agent on the ground until our manager should be appointed and installed. This company is showing excellent growth and satisfactory operation.

(H. F. Grant.)

SYDNEY, CAPE BRETON.

Eastern Canada has been up against the real thing this year in the matter of weather. We had a hard winter, lots of snow, cold weather and high winds, and we have had a bad summer, cold, cloudy and lots of rain, a fine day being the exception. Our fall to date has not shown any improvement. These conditions have a tendency to lower our receipts on the interurban lines and ferry boats. The receipts on the city line are as good as, and some months better than, the corresponding months last year, and we are glad to state that our lighting gross is continually increasing. The writer on a recent trip through lower Quebec, saw thousands of scress of oats that had not begun to show any signs of ripening, and it is rather doubtful, with the continued rainy weather, if they will ripen in time to be harvested this fall. This is extremely bad for this section of the country, as all crops are short.

The Dominion Iron and Steel Company was given judgment in the lower courts in its recent litigation with the Dominion Coal Company, regarding the Steel Company's supply of coal. In all probability the case will be appealed to a higher court, and eventually go to the Privy Council in England, as there seems to be little prospect of the two companies arriving at any settlement outside the courts. The Steel Company reports lots of orders ahead, and good prospects. The Coal Company is also shipping coal as fast as it can get it from the mines, but owing to the late opening up of the shipping season last spring, it is rather doubtful whether it will be able to fulfil its contracts for delivery of coal.

The new boiler for the ferry boat "Peerless" has been installed and inspected by the Government inspector, and the boat is now in commission.

Contracts have been executed and construction commenced on our new power house at North Sydney and transformer house at Sydney. The new power house for the Sydney & Glace Bay Railway Company, at Glace Bay, is nearly completed, and some of the machinery has arrived on the ground.

We have just purchased a new Wilder radial snow plow with the shovel type of nose. This plow is double truck and will be equipped with four motors. Compressed air will be used for operating the noses, wings, scrapers, sanders and brakes. This plow will be used at our North Sydney and Sydney Mines division, and we expect to accomplish good results with it.

Mr. A. F. Townsend has returned from a trip to the States

and Montreal. While in Montreal he attended the convention of the Canadian Street Railway Association, and Canadian Electrical Association, and reports a very successful convention.

Mr. J. H. Leitch, assistant treasurer of the Cape Breton Electric Company, Limited, and treasurer of the Sydney & Glace Bay Railway Company, Limited, was recently in Boston, and attended the American Street Railway Convention at Atlantic City.

The merchants in Sydney are holding a Mercantile Fair in the Rink this week, and each one is endeavoring to make this fair a great success.

The company has selected one of the best locations in the Rink and is erecting a booth on the bungalow style, designed by our contract agent, Mr. Rasmussen. On and in this booth we shall have a large lighting display, as well as a display of small motors, cooking utensils and flat irons. We shall also have a demonstrator to demonstrate the use of all the different appliances. A rack of glass covered meters will be connected up on different loads, with a competent meter man in attendance, so as to explain the mechanism and working of the meters, and also show people how to read their own meters, if they wish. We have found that in our display window, meters where the discs are in plain sight, travelling at different rates of speed, on different loads, create a great deal of This is especially true of a meter connected up on a load that is thrown on and off by an automatic arrangement. creater attention, as doubting customers can easily see that the meter stops immediately when the load is thrown off.

(A. F. Townsend.)

TAMPA, FLORIDA.

Tampa was represented at the Tobacco Exposition, which was held during September at the Madison Square Garden in New York City. The funds, which furnished the fine display made, were contributed in small amounts by the people of the city. The Tampa booth, which attracted much attention, was in charge of a committee from the local chamber of commerce, headed by President J. T. Laud Brown, and much valuable advertising was given us during the two weeks of the exhibition.

The city's tax assessment for 1907 has been completed and amounts to \$13,378,155.

The Tampa Electric Company has been unfortunate enough to lose two very valuable men during the month of September. Mr. Herbert Nash, Jr., formerly acting superintendent of the lighting department, has been transferred to Pensacola to assist Mr. Leadley, and will have charge of the lighting department of the Pensacola Electric Company. Mr. Nush was very popular with the employes, as well as with the patrons of the company, and his friends wish him success in his new field.

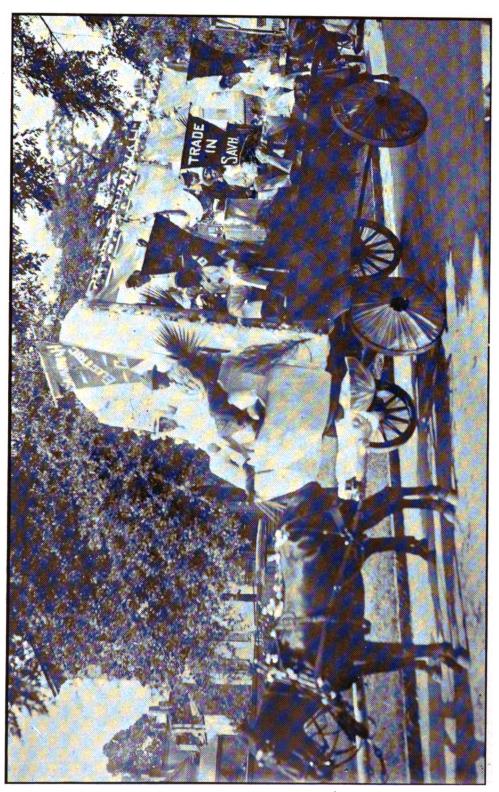
Mr. H. L. Stanley, assistant superintendent of the railway department, has been transferred to Savannah, and will be connected with the traffic department of that company. Mr. Stanley is a hail fellow well met, and is universally liked by his associates, as well as by the patrons of the company, all of whom give him their best wishes in his new field.

We have recently received twelve twelve-bench open cars from the J. G. Brill Company, and have getten them into active service. These cars are equipped with G. E. 67 motors, and add very materially to the efficiency of our rolling stock department. Our patrons seem well pleased with the additional new cars, and give them a decided preference in their pleasure riding.

Mr. Charles F. Wallace, sponsor for our company, and a member of the Executive Committee, paid an extended visit to Tampa, arriving here on Saturday night, September 14, and leaving for Jacksonville Thursday night, September 19. His visit was in part one of his regular trips, but it was mainly for the purpose of looking over the ground with a view to making recommendations for additional apparatus needed at the power station, as well as for a general rearrangement of our distributing system. Mr. Wallace was assisted in this work by Messrs. Walter Goodenough, manager of the Southwestern District of the Engineering Corporation, and R. A. Philip, electrical superintendent of the Engineering Corporation, who were on the ground several days prior to Mr. Wallace's arrival getting up the necessary data for the proposed additions and rearrangement.

Mr. Goodenough arrived in Tampa Thursday, September 12, and left for New Orleans and Dallas Wednesday, September 18. Mr. Philip came in several days before Mr. Goodenough, and left on Friday, September 20, for Jacksonville and Boston.

Mr. J. F. Vaughan, of the Engineering Corporation, has been with us for several weeks, and is assisting Manager Trawick and Superintendent Webb in a general rearrangement of the traffic service, looking toward its permanent betterment. We are contemplating a number of changes in schedules of both cars and trainmen, with a view to a general improvement.



Mr. Converse D. Marsh, chairman of the Executive Committee of the Bates Advertising Company, spent several days in Tampa in the interest of his company during Mr. Wallace's visit, looking over the ground here with the intention of assisting the local management and contracting department in an extensive advertising campaign, which will be inaugurated within the near future. Mr. Marsh expressed himself as being very much pleased with Tampa and her future, and prophesies great things for our lighting department.

The postal revenues for the month of August were \$9767.54, against \$7076.23 last year, making an increase of \$2691.31 or 38 per cent.

TAMPA, FLORIDA.

Up to September 28, Tampa has shipped 206,940,000 cigars from the numerous factories. For the same period last year (January 1 to September 28) the output was 191,840,000 cigars, which shows a substantial increase in spite of the difficulty in securing Cuban tobacco, and the high price at which it is held. The factories are all working full force getting up holiday orders, and between now and the first of the year several hundred more cigarmakers could be given employment if they were in the city.

The Government is making a number of improvements at Forts Dade and De Soto on Egmont and Mullett Keys at the mouth of the harbor, and the number of artillery companies to be stationed at the forts has been increased from two to three.

Mr. Hugh C. Macfarlane, of West Tampa, has donated to that town twenty acres of land on the west side of the city equally distant from the northern and southern boundaries of the municipality. West Tampa has no park of any kind within its limits, and this tract of land will be beautified and afford a much appreciated pleasure ground for its citizens. There are twenty acres of land adjoining Mr. Macfarlane's donation, which the city contemplates condemning and adding to the other, in order to give a larger area for park purposes.

The summer theatrical season at our Ballast Point casino came to a successful end September 28. The ride along the bay shore and the performances in the cool pavilion, built partly over the water, have given much pleasure during the warm evenings of the summer to those remaining in the city.

The company is pushing the work on the Seventh Avenue

extension. This will serve a quite thickly settled community, and when in regular operation it will be a great factor in still further building up that section of the city.

The company is cleaning up and beautifying De Soto Park, which is one of the prettiest spots in or about the city, the grove of palmetto trees extending from the shore of the bay being one of the finest anywhere in this vicinity.

- Mr. G. O. Muhlfeld, of the Stone & Webster Engineering Corporation, arrived in Tampa on a brief tour of inspection October 5. Mr. Muhlfeld was in Tampa for several months a few years ago, and he is always welcomed by a large number of friends whenever he comes to the city. Mr. Muhlfeld was accompanied by Mr. L. H. G. Bouscaren, who has come here to superintend some construction work for the corporation at the West Jackson Street station.
- Mr. J. F. Vaughan, of the Engineering Corporation, who has been in Tampa for several weeks studying traffic conditions, left for Pensacola October 11.
- Mr. E. B. Powell, also of the Engineering Corporation, who spent a couple of months in Tampa during the summer, made a short return visit during October, leaving here for Pensacola the latter part of the month.

Our assistant treasurer, Mr. C. H. Byrne, left October 9 for the Street Railway Convention at Atlantic City, being the only delegate from the Tampa company at the convention. Before returning to Tampa Mr. Byrne will visit Boston and New York City. Mr. Byrne is one of the most popular men, with both our patrons and employes, that Boston has ever sent to Tampa, and it is hoped that he will return rested and benefited by his vacation.

(J. A. Trawick.)

SAVANNAH, GEORGIA.

No half-tone print could do justice to the beauty of the splendid float which the Savannah Electric Co. contributed to the Labor Day parade in Savannah, Ga., but the accompanying photograph will give some idea of the general scheme. Although only two mules appear in the picture, the float was drawn by four fine, big animals, their harnesses profusely decorated with roses and white ribbon.

The float itself was "a thing of beauty," and easily won first prize in the manufacturers' class.

It was constructed on the largest truck that could be found in Savannah and was driven by the largest colored driver that could be gotten. (The Savannah Electric Co. believes in doing things on a "large" scale.) The color scheme was white and red, with twining roses and big green palmetto leaves used in an artistic manner.

The banners were red, and the lettering brilliant gold. These were carried by six little colored boys, seated three on each side of the float, who, together with the driver, were immaculately dressed in white. Four of these side banners, and the large one on the front of the float, glittered with "Savannah Electric Co.," while the two middle banners, as well as the long red streamer which ran the entire length at the top of the float, were lettered with the company's war cry--"Trade in Savannah"—which has become contagious throughout the city.

On the float were all kinds of household electrical appliances, and there, too, was the "Housewife" giving actual demonstrations as the parade passed through the streets. On the rear of the float were two megaphone men, who "shouted" for the company and distributed printed matter to the spectators.

(E. M. Carney.)

QUOTATIONS

ON

SECURITIES OF PUBLIC SERVICE CORPORATIONS

UNDER THE MANAGEMENT OF STONE & WEBSTER

NOVEMBER 1, 1907

NOTE:—Quotations are approximate. Unless indicated to the contrary Bonds and Notes are 5 per cent and preferred stocks 6 per cent non-cumulative. Bonds are sold plus accrued interest.

COMPANY	BONDS	PREF.	OOM.
Blue Hill Street Railway Co., The	95	No pref.	• • • •
Brockton & Plymouth St. Ry. Co.	95	No pref.	••••
Cape Breton Electric Co., Ltd.	88	80	15
Columbus Electric Co.	90	••••	• • • •
Columbus Power Co., The	96 95	2	16
Dallas Electric Corporation	871/2	60	20
Edison Elec. Ill. Co. of Brockton	100 100	No pref.	120
El Paso Electric Co.	921/2	873/2	45
Fall River Gas Works Co.	No bonds	No pref.	230
Galveston Electric Co.	921/2	88	25
Galveston-Houston Elec. Co,	••••	88	25
Houghton County Elec. Lt. Co.	921/2	221/2	14
Houghton County St. Ry. Co,, The	90	95	25
Houston Electric Co.	95	88	25
Jacksonville Electric Co.	921/2	90	80
Key West Electric Co., The	••••	2	••••

COMPANY	BONDS	PREF.	OOM.
Lowell Elec. Lt. Corporation, The	100	No pref.	180
Minneapolis General Elec. Co., The	99	100	90
Northern Texas Electric Co.	941/2 3	75	30
Paducah Traction & Lt. Co.	85	60	18
Pensacola Electric Co.	871/2	85	26
Ponce Electric Co.	100 7	No pref.	• • • •
Puget Sound Electric Railway	97½ 94¾	88	45
Puget Sound Power Co.	99	No pref.	15
Savannah Electric Co.	92	75	121/2
Seattle Electric Co., The 1st m'tge Consol. and Refund m'tge convertible " " " non-con. Notes	95 92½	90	80 18
Tacoma Railway & Power Co.	98	No pref.	17
Tampa Electric Co.	No bonds	No pref.	105
Whatcom County Ry. & Lt. Co.	95	88	44

1.—Cumulative. 2.—No dividend yet paid. 3.—Bonds of Northern Texas Traction Co. 4.—5 per cent. 5.—Cumulative after Dec. 1, '07. 6.—1 per cent paid Dec. 1, '06 and June 1, '07. 7.—6 per cent. 8.—Par \$28. 9.—Listed Boston and Louisville. 10.—Listed Boston. 11.—Listed Louisville. 12.—Listed Columbus, Ohio. 18.—Listed Boston, Columbus Ohio, Louisville. 14.—Listed Louisville, Columbus Ohio. 16.—Held by Seattle Electric Co. 16.—Held largely by Columbus Elec. Co. 17.—Held by Puget Sound Elec. Ry. 18.—4% per cent.

STONE & WEBSTER Securities Department

OFFICES:

Boston - - - 84 State Street Chicago, 604 First National Bank Bldg.

NOTE. — The Securities Department handles securities for those wishing to purchase or sell, keeps accurate quotations, and gives out nformation about above companies.

Miscellaneous Notes

COUPONS AND DIVIDENDS DUE

	Per (Cent.
Dec. 1	Brockton & Plymouth St. Ry. Co., 4 1-2 due 1920	21/4
Dec. 1	Edison Elec. Illg. Co. of Brockton, 5s, due 1930	$2\frac{1}{2}$
Dec. 1	The Minneapolis General Elec. Co., 5s, due 1934	21/2
Dec. 1	Puget Sound Power Company, 5s, due 1933	$2\frac{1}{2}$
Dec. 1	Pensacola Electric Company preferred stock, 6 p. c.	3

LIBRARY

OF

STONE & WEBSTER

Current Literature

Selections from Recent Magazines and Book Accessions.

Ed., (r), *, and + are used to indicate editorial, review, illustration, and map or diagram, respectively.

Concrete and Construction.

1 Machinery and methods for the excavation of sky-scraper foundations; plt and processes; caisson foundations; a study of underpinning; danger of caisson disease. TKThompson. *+81-24p-Engrg Mag-10|07

2 Report of the special com on reinforced concrete of the Egrs' Club of St Louis embodied in the bldg ordinances of the city of St Louis. Specifications for reinforced concrete structures; physical properties of steel; tables; weights of bldg materials; distribution of load for structural members. (Disc 5|17|07). +152-16.5p-Journ Assn Engrg Soc-9|07

Hydro-electro Plants, Central Stations, etc.

3 The new pr plt of the Lowell El Lt Corp—a detailed account with drawings. +643-4.3p-Elec World-10|5|07

4 History of hydro-el & gas develpmt in Central Cal. The various systems of the Cal Gas & El Corporation. *+231-18.5p-Journ Elec Power & Gas-9|21|07

5 System at Minneapolis for distributing the energy transmtd from Taylor's Falls; sub station at the city limits; distribting sub stations. *+647-3.5p-Elec World-10!5|07

The transmsn plt of Niagara, Lockport & Ontario Pr Co. RDMershon, AIEE. *1367-40p-Proc Am Inst Elec Engrs-9|07

7 Metering comm e'll currents; integrating wattmeters described; bearings; torque weight & friction; recording mechanism; energy losses & accuracy formula; pr factor. Abs HMiller. *+584-14p-Elec Journ-10|07

8 Wiring & connections for constant potential transformers; the core-type & the shell type. GABurnham. +661-4p-Elec World-10/5/07

9 A new determination of the ratio of the electromagnetic to the electrostatic unit of ely. EBRosa & NEDorsey. *+433-111p-Bull of Bureau Standards-8!07

Synchronizing; devices, operation, etc. PaulMacGahan&HWYoung.
 +485-11.4p Ed 481-0.8p-Elec Journ-9!07

Lighting. (See also 25, 26)

11 Proceedings of the 15th an mtg of the Pac Coast Gas Assn held at Santa Cruz 9|17-19|07. A recent high pressure installation, ECJones; Sulphur and oil gas, PWPrutsman; Repairing the cup of a two-lift 500,000 cu ft gas holder, GSColquhoun; Comparative economics in operating small motors by gas, gasoline and el, LHNewbert; History of Hydro-el & gas develomt in Cen Cal, JABritton. *+571-16p-Progressive Age-10|15|07

12 On the determination of the mean horizontal intensity of inc lps, Method & results of recent experiments. EPHyde & FECady.

•357-12p-Bull Bureau Standards-8|07

The Helion 1p HCParker & dis AES. 375-7p in *6900.Ce 42.05,1907

Steam Engineering.

14 Pr costs. Water pr, oil pr, stm pr, per kwh, etc. CELucke & dis
AES. +339-29p in *6900.Ce 42.05,1907

15 Technical aspects of oil as fuel; evaporation characteristics of liquid hydro-carbons; methods of introducing air. FEJunga. +665-3.5p-Power-10007

16 Commutating-pole dc ry motors. EHAnderson, AIEE. +1265-10.5p-

Proc. Am Inst El Engrs-9107

17 Some commerciand practical notes appertaining to struct ry enterprises; fundamental principles of management; the supervising egr; duties of the track inspector; maintenance of rolling stock. WRBowker. 618-11p-St Ry Bull-10|07

18 Foundations for el st ry rails. WRBowker. ++550-6p-St Ry Bull-

9j07

19 NYRR Club paper and discussion on Stm vs el locos; Comparison of costs, etc. 9|20|07. Abs MToltz. 453-5.6p-St Ry Journ. Ed 444-2.5p-9'28'07

Railroad electrification on the New York Central, West Shore, Long Island, New Haven, West Jersey and Seashore & Erie railroads; operating features, pr stations, rolling stock, substations, distribution, transmission, etc. Electrification in Europe. 539-105p-St Ry J(sup)-10/12/07

21 Rep of com ASIREA on maintenance & inspection of el'1 equip-

ment. *+489-5p-El Ry Rev(d)-10|15|07

22 Line construct for interurban el rys, with data on costs. I. *+937. 4.5p-Elec Traction Week-10;3|07

8 High-voltage dc & ac systems for interurban rys. WJDavisJr & dis AlEE. +1353-12.5p-Proc Am Inst Elec Engrs-8|07

Public Relations. (See also 29)

24 Pub control from the corporate standpoint; develpmt of pub control in this country; defect in Mass law; present & former a:titudes of corps. EWBurdett. 569-2p-Progressive Age-10|15|07; 406-1.9p-El Ry Rev-10|5|07

25 Control of gas cos by state commsns. AEHumphreys. 668-2p-Am Gas Lt Journ-10:14|07; 587-2.5p-Progressive Age-10|15|07

Book Accessions.

26 Procdgs of New England Assn Gas Egrs, Boston 1897 to 1905 inclusive. Illus Diags 6x9, (gift) *1000G21.058,1897-1905

Water resources of Georgia BMHall & MRHall U. S. Geological Survey 1907. Map. Tables 6x9,pp342 (gift) WSIN0.197

Surface water supply of New England (Atlantic Coast of NEdrainage) HKBarrows, USGeological Survey and Irrigation Paper 201 1907 Illus Map 6x9 pp 120 (gift).

Ry corpus as public servants. HenrySHaines, 1907, 6x8 pp 238 *93H12,1907

80 Mun Manual & offi directory of city of Detroit, Mich, 1907, containing departmental. historical, & misc information, 3x6, pp142 (gift) a*2972M92.02-1907

FrankA.North *03.NS1-1906

- 31 Transactions Amn Electrochemical Soc. Vol XI. Eleventh gen mtg. Philadelphia 5|2-4|07. Illus 6x9 426p (gift) *6900 Ce 4205 1907
- 32 Corporation handbook. Merchants edition. Regulations relating to organization & management, with special reference to Massachusetts. Changing a partnership to a corporation.

Extended Titles.

The titles of the following publications are so extended as to form a brief summary of the contents.

33 Report of an investigation by a Board of Engineers of the means of controlling floods in the Duwamish-Puyallup valleys and their tributaries in the State of Washington. Cause of floods; proposed treatment, with estimated cost, of Puyallup, Duwamish, Green, White, Rlack and Cedar rivers. Map of the valley. 32p-6x9-Sowman&Hanford. Seattle, 1907. *6130 D95 073-5|07

\$4 Southern Appalachian streams. Water powers of the New, Roanoke, Cape Fear, Yadkin, Catawba, Chattahoochee, Lillie Tennessee, French Broad, and Tennessee rivers. Developments by the Southern Power Co., the North Georgia Electric Co., and Value of forests in conserving stream flow CEWaddell ++161-14,5p-Journ Franklin Inst, 9|07

35 Synchronizing. Requirements of synchronizing devices; use of synchronizing lamps and synchroscopes; construction and operation of inductor, Lincoln, and automatic types. PMacGahan

&HWYoung. 485-11 5p-Electric Journal-9|07

36 Lightning phenomena in electric circuits. The phenomena arising from abnormal voltage or frequency conditions in the transmission line; their causes; how the power of the oscillation may be calculated, and the circuit protected. SPSteinmets The Electrician, 8|30|07, p780+3.6p

\$7 Plans, specifications, and contract for hydro-electric machinery and appurtenances in the Seattle municipal lighting and power plant, including generators, transformers, rheostats, switchboards, wire, pipe, water-wheels, insulators, etc. City Engineer. *6131, M92, 071301 7|11|03 RHThomson,

38 Impersonal taxation; a discussion of some rights and wrongs of governmental revenue. Feudalism, taxation of real and personal property, income, franchises, transfers, etc. 149p-supplement Annals Am Acad Polit & Social Science. 9|07



STONE & WEBSTER

84 STATE STREET, BOSTON

General Managers of

The Lowell Electric Light Corporation The Seattle Electric Company Puget Sound Electric Railway Columbus Electric Company Cape Breton Electric Company, Ltd. El Paso Electric Company Jacksonville Electric Company Ponce Electric Company Northern Texas Electric Company The Minneapolis General Electric Company Edison Electric Illuminating Co., of Brockton Houghton County Electric Light Company Brockton and Plymouth Street Railway Company The Houghton County Street Railway Company Whatcom County Railway and Light Company Savannah Electric Company Dallas Electric Corporation Paducah Traction and Light Company The Blue Hill Street Railway Company Fort Hill Chemical Company Tampa Electric Company Pensacola Electric Company The Key West Electric Company General Electro-Chemical Company Houston Electric Company Galveston Electric Company Fall River Gas Works Company Baton Rouge Electric & Gas Company Puget Sound International Railway & Power Co.

